A study into students' use of digital technologies to support writing difficulties, with a particular emphasis upon text prediction

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Abstract

Digital technologies now exist which support and assist writing activities for those who have difficulty with its production. These include the development of specific technologies such as text prediction, text to speech support, speech recognition and more recently applications on mobile technologies such as smartphones and tablets. However, research into the contexts in which these are used and who actually uses them is limited. This qualitative research explores the potential affordance of technologies with individuals who have been unable to construct text either efficiently or independently through other methods. It is a journey of discovery about the specific needs of the individual, the technologies they try and the affordances they offer. Yet, how these have been used has not only been influenced by the individual needs of the user, but the contextual considerations of the environment and the perceptions of literacy in which they are situated.

Using a participatory methodology, the study sought to take into consideration a social and cultural understanding of the settings in which textual production took place. It offers a valuable insight into the contexts in which technologies have been used and how individuals have been able to exert choice and autonomy. It does not dwell purely upon successful implementation but demonstrates the problems, frustrations and barriers some have encountered as they have endeavoured to strive for productivity. The significance of the tools they eventually used to compensate or overcome the issues they faced is of significance. Importantly it examines whether concepts of learning difficulty and impairment are exacerbated by a lack of contextual consideration and not with individual deficit.

The study also considers how some schools have lacked awareness and knowledge of the availability of different types of digital technologies specifically designed to support the writing process. It argues that the pen and pencil as tools for expression of literacy competence induce difficulty for some students. It examines the issues of those who cannot use these specific tools, but who are able to produce textual meaning through other modes. Yet, how they are able to do so is affected by contextual considerations of the environment, attitudes and perceptions of literacy that impact upon their utilisation.

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I would also like to thank my friends and colleagues who have always been so willing to show an interest or lend an ear, but particularly those that gave me the initial impetus to begin. My love and inordinate thanks go to my family who have always been there for me by showing constant and unfailing support throughout but also their patience and forbearance.

Finally, my thanks to all the adults, children and their families I have been fortunate to have known and worked with over the years who have taught me so much.

Abbreviations and Glossary of Terms:

AAC: Augmentative and Alternative Communication

App: an application (software) used on a smartphone or tablet technology

Athetonia: a slow, writhing involuntary muscle movements.

Augmentative and Alternative Communication (AAC) : electronic and non-electronic devices and software that provide the means for communication for students with poor speech and language or complex communication needs

Cerebral: of the brain

Cerebral Palsy: a physical condition that affects muscle control and movement. It is usually caused by an injury to the developing brain, which may be caused during pregnancy, during or shortly after birth.

DSA (Disabled Students Allowance): allowance paid to disabled students to enable funding of additional resources for study

DLA (Disabled Living Allowance): funding for additional expenses incurred as a result of disability

Dyslexia: a difficulty commonly associated with reading and writing, but may also include other issues such as difficulty with planning and organization

Dyspraxia: lack of sensory integration affecting motor co-ordination

ICT: Information and Communication Technology

JCQ: Joint Council for Qualifications

LEA: Local Education Authority

SAT: Standard Attainment Test

SQA: Scottish Qualifications Authority

Tablet (technology): a digital device with onscreen keyboard and touch interface (screen)

Teaching Assistant (TA): person employed to support teachers

Abbreviations:

*** denotes a specific product name

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Foreword

> *"A story should have a beginning, middle, and an end... but not necessarily in that order" (Attributed to Jean Luc Godard)*

As an observer, the emergence of writing from a young child's first intended marks made with a finger or implement, to the confidence which results in a flourish of printed text, interest me as much today as the process did when I first started teaching and later as I watched my own children learn to read and write. I am intrigued by the transformation from an early form of representation, which may initially merely resemble scratches, lines or distorted shapes, to a form of presentation that becomes recognizable to others when it appears on a page or a screen. Initially these marks may require some form of oral interpretation to convey their meaning and yet, within a relatively short period of time, a recognizable image or some representation of an alphabetic (logographic) code or regular symbol begins to be used with increasing frequency. Being unable to recall my own early journey into writing, the role of an observer, whether from the stance of parent or teacher, holds the next best view for me into the world of the development of written text.

As the introduction to this study will reveal, it was this fascination with the way that children can begin to use symbolic representation and then shape this into meaning for others, which initiated my early research. However, as the reader will quickly learn, it was also immersed in a world where, for a variety of physical and contextual reasons, some could not always accomplish this emergence and transformation with ease. My early teaching days, as well as subsequent years, were spent with children and adults who had either struggled to learn to read or to use what might be considered conventional tools for writing that others could manipulate with ease. This period also coincided with the emergence of digital technologies that offered the potential to transform the literacy opportunities for many of the individuals with whom I worked. Today, it is impossible to ignore the increasing use of such technology around us and it has changed the methods by which meaning can now be both produced and transmitted. Instead of the paper and pencils that I used to construct texts as a child, my children used similar tools but also the home computer, a novelty amongst some of their peers at the time. Today, I watch even younger children using mobile technologies; listening and looking at stories, watching movies and interacting with games on a screen. Here, in the twenty first century, we have opportunities to produce and interact with a digital representation of text in a range of modalities that are now commonplace in many homes and schools.

An essential theme runs throughout this study since neither I, nor my children, ever struggled to read or to write. Those abilities developed effortlessly. However, since many years have been spent working with students, both children and adults for whom the same tasks were not so easy,

I do not take the acquisition of these abilities for granted. Observing the stumbling efforts of a child trying to make sense of an elusive code or talking with adults about the frustrations of their school years, their feelings of inadequacy and failure, which can still linger even though many years have since passed, have given me many insights into a small part of the daily battles with literacy that some individuals experience. Their stories prompted my efforts to seek alternative or emerging methods and tools to make learning to read and write achievable and the world of print accessible. I want these to be pleasurable experiences, not humiliating ones. My interest and early forays into the use of technology played an enormous part in this quest. These have led to both personal and professional development and now an interest in researching it academically.

This study, therefore, is an attempt to combine an understanding into the use of technologies and their role in writing development with those whose paths into literacy may not necessarily be simple or smooth.

Chapter 1: Introducing the Research Setting

1. Introduction

Writing is an activity that can be taken for granted but for some individuals the ability to write with any degree of proficiency is not only a challenging experience, but remains a lifelong issue. The use of digital technologies is sometimes adopted as a means to help with such difficulties. This opening chapter explains why my own experience working with students influenced and prompted this research. It has been explored through three strands of focus: Disability and Learning Difficulties, Digital Technologies and Literacy which have offered a means through which to consider the complexity of issues surrounding writing difficulty and the use of different types of technologies. My focus upon writing support is explained and why my research began with an interest in one specific type of digital technology, text prediction, but broadened to involve students' personal selection of digital technologies. Consideration is given to the specific ways in which these can be attributed either as a compensatory or supportive technology and explores what these terms mean through analogies of use. The chapter continues with further consideration of associated terminology and concludes with a description of text prediction and how this focus shaped my initial approach to the enquiry.

2. The Research Setting

> *"Little is known about the conditions under which these assistive tools are useful" (MacArthur, 1998)*

Writing is a complex activity that requires the ability to employ and coordinate the linguistic, cognitive and physical processes to create text (Myhill, 2010). However not everyone is able to execute the task with proficiency (Augur, 1995; Graham, 2006; Troia, 2006). Some individuals have specific difficulties with writing which result in texts that have been poorly executed (Glynn et al., 2006; Graham et al., 2001; Thomson, 1997a). They may be reluctant to write or even refrain from ever putting words into print at all (Gilchrist, 1997; Rahamin, 2004). Others may have difficulties with writing that have remained unrecognised throughout their schooling and still affect their adult lives (Stewart, 2007). For some, their difficulties may lead to dependency upon the use of an amanuensis, yet others use technologies to compensate for their individual issues (MacArthur, 2000, 2006, Ott, 1997). Such is the myriad of issues concerning difficulties with writing.

Digital technologies for writing support, such as text prediction, text to speech support, speech recognition technology and more recently applications for mobile technologies such as smartphones and tablets now exist. Some have been specifically developed to support and assist specific aspects of writing activity for those who experience difficulty. However, research into the

contexts in which they have been used and who actually uses them remains limited. The quotation that opened this section was written over a decade ago but there is still an absence of adequate understanding into the contexts in which digital technologies can be used and a lack of research into their implementation (Abbott, 2007; Peterson-Karlan, 2011).

> *"What we do not know enough about is who can benefit in what contexts." (MacArthur, 2009)*

MacArthur's words prompted my research question. However, my research was provoked by personal experience with using digital technologies, and specifically those of text prediction, with students. Some of these explorations have been described a little later in the chapter. These students had either found the writing process difficult or were reluctant to write. However, this experience also included children in their first years of formal schooling who were only just beginning to want to.

My qualitative research used an interpretative framework to explore the contexts in which students experiencing difficulty with writing used digital technologies to support their activity. It was set within the UK and addressed the question:

What are the contexts in which students use digital technologies, including text prediction, to support their writing difficulties?

Using a participatory methodology, which sought to take into consideration a social and cultural understanding of the settings in which such activities took place, my research used three specific strands of focus because it did not fit neatly into one discipline. These were represented with the headings of Disability and Learning Difficulties, Literacy and Digital Technologies (see Figure 1). Disability and Learning Difficulties incorporated a social understanding of the needs of individuals. Digital Technologies included the use of digital technologies in order to support learning but, particularly, the development of writing. Literacy contained my interest in writing and specifically the types of literacy activities for which digital technologies were used, as well an understanding of the specific needs of students with learning difficulties or disabilities who found the activity difficult. Yet, even before I have begun, all three of these strands invoke a greater consideration of terminology and understanding that I need to address. I will begin to do so throughout this chapter, but delve into some in far greater depth in the next.

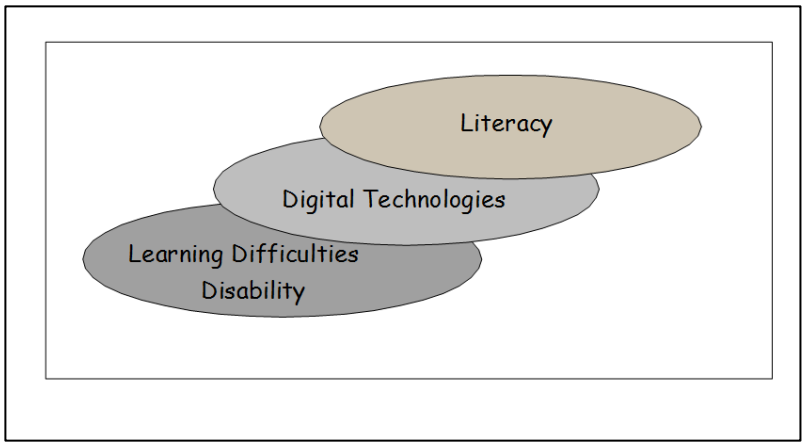


Figure 1: Three Strands of Focus for Research Approach

In order to address the key question, five sub-questions shaped my exploration:

- *Do students use digital technologies to support writing?*
- *Who uses digital technologies and why?*
- *What technologies are used?*
- *What are digital technologies used for and what motivates this use?*
- *When and where are digital technologies used?*

These questions were explored with those who supported students with disabilities and learning difficulties as well as those who developed software for writing support. This set a background and wider context to draw upon but, essentially, my focus centred upon the students themselves; their use and their opinions. Using an 'ethnographic perspective' (Green and Bloome, 1997), a term I will explore further in Chapter 3, I have concentrated upon the experiences of four significant informants who each used an array of digital technologies to support their specific issues with writing. These stemmed from their physical, although not necessarily visible, issues with the production of text.

Two of my significant informants were of school age, a ten-year-old girl and a boy of fourteen years. The other two were both adult males undertaking graduate and post-graduate study. Each had difficulties associated with either physical impairment, complex speech and articulation difficulties, a chronic medical condition or dyslexia and dyspraxia. Our conversations offered a glimpse into their use of chosen technologies and previous experience of others, as well as a unique opportunity to learn valuable insights into why this use occurred. My research captured the individual experience of choice and quest for autonomy. It also provided a longitudinal representation of technology use rather than just captured from an isolated interview or observation. My findings did not dwell purely upon successful use but demonstrated the problems, frustrations and barriers encountered as individuals endeavoured to strive for

independence and productivity in literacy focused environments. The significance of the tools they used to attempt to compensate or overcome the difficulties they encountered is of consequence.

My thesis argues that the use of digital technology for writing activities requires consideration that matches technologies to the specific and unique needs of the individual, but that some schools generally lack knowledge concerning the availability of digital technologies which might offer support to those experiencing difficulty. It also argues that prioritising the pen and pencil as tools for the teaching of writing and expression of writing competence, induces difficulty and exclusion from activity for some students. This occurs from the moment a child enters school until the completion of final year examinations. My research examines the issues of those who have difficulty with producing handwritten text, but who are able to display compositional ability through the affordance of their chosen digital technologies. Yet, how they are able to use these is affected not only by contextual considerations of the environment in which they are situated but also by perceptions of Literacy itself.

My thesis begins with a brief exploration of the key terms used by the three strands of focus in which my story is embedded and describes what initiated my interest. My Literature Review (Chapter 2) explores each strand in greater depth and the further considerations that each provoked. I have also briefly explored some of the literature regarding text prediction, the initial focus, together with the difficulties encountered with researching this area. Chapter 3 describes my methodology and the structure of my research approach. It explains why my research was broken into two distinct phases and how it had begun as a qualitative investigation into the use of text prediction technology alone, but unfolded into the presentation here: a portrait of digital technology use with those who have difficulties with writing. I also describe the presentation of the subsequent chapters and how I have made use of Wolcott's approach to presenting qualitative data in three distinct phases separating description, analysis and interpretation.

Chapters 4 to 6 concentrate upon the stories of the three younger significant informants through a specific theme for each. These are set amidst a wider back ground of experience drawn from the other data. Chapter 4 considers the existence and construction of barriers that preclude the consideration and incorporation of digital technologies for writing activity and the impact that this has upon perceptions of disability or difficulty. Consideration is given in Chapter 5 to the requirement to handwrite text in schooled contexts and how this is prioritized and given significance above other forms of textual production. Access to the exploration and distribution of knowledge concerning digital technologies and their use is the focus of my final theme in Chapter 6. Amidst other factors, these three chapters examine the influence of social and cultural considerations and expectations of Literacy and its resulting impact upon perceptions of Disability and difficulty. My final chapter completes my thesis with a summary based upon each

of my original questions, an interpretation of my findings and a reflection upon my research approach, together with the implications for future investigation.

My study offers a unique contribution to knowledge on a number of levels. First of all it encapsulates a consideration of three distinct strands of focus through one exploration. It considers the contexts in which digital technologies are used within the concepts and explorations of what is involved in any understanding of literacy, disability and learning difficulty. A range of digital technologies have been identified in my findings but some have also been used within the methodological process itself. Most importantly my research has been participatory and has involved those who have experienced use to partake within it with meaningful purpose (Balandin et al., 2000; Rackensperger et al., 2005; Wickenden, 2010). The four students upon whom it focuses each offered their own exclusive perceptions into their personal use of digital technology. These experiences provide a unique contribution to the body of knowledge regarding the use of digital technologies for writing considered within a sociocultural perspective. However, before proceeding further, I need to briefly explain some of the terms of reference used in each of the three strands of focus that provide a framework for my research setting. Some warrant the further depth of discussion to be explored in later chapters.

2.1 Terms of Reference

The gender term of he has been used when referring to individuals. This was adopted for convenience of use and not to imply that the issues to which I refer concern only the male population. Similarly the term student has been used since it covered any age range considered from young children through to those of a mature age engaged in study within an educational context.

I have preferred to use the term impairment rather than physical disability, because of a consideration that disability is created by, and as a result of, context. However, this distinction is not one necessarily reflected in the literature and at times the term may appear in the context of the author or the setting within which it was used.

The term SEN for Special Educational Needs, learning difficulties or differences has been used to refer to students with educational needs. Like the term disability, the term difficulty has as much to do with context and period as it does as a term to describe individual need. I have leaned towards the use of specific or individual needs in order to encompass that consideration.

The term writing has been used so far, but it was necessary to employ greater precision since my focus in the final construction of this thesis centred explicitly upon the processes by which meaning was produced. Focusing explicitly on the production of text was based upon the consideration that writing involves three specific stages using Hayes and Flower's original 1980s

model of *planning, translation* and *review* (Flower and Hayes, 1981). I have used the term construction to imply the processes involved in planning within the first stage, later reconceptualised as *reflection* (Hayes, 1996), which envelops the physical transformation of the cognitive process into the creation of text (Myhill, 2010) and requires *"the retrieval of ideas and information from the long-term memory, the generation of new ideas through synthesis and imagination, and the formation of a pre-verbal message"* (Myhill, 2009a:2).

Hayes subsequently revised the stage of translation to *text production* since it incorporated "*spoken and graphic output*" as well as written text, where spoken language encompassed editorial comment but also dictation as the "*output medium*" (ibid). The use of the term production therefore suited this second stage of writing activity since it could be used to encompass any action conducted through technologies by individuals in this research specifically before the third stage. Production, therefore, in the context that I have used it, was a means to isolate and focus upon the process involving the physical execution of the task. As an encompassing term, it permitted consideration of the individual and specific demands of the activity being conducted by each specific student and in particular those where students have used different modes for this second stage, including that of speech, either through an amanuensis or with speech recognition technology.

My study drew upon sociocultural understandings of Literacy but also those of Disability and Learning Difficulties. I have, therefore, drawn upon the work of Bourdieu in order to find terms to conceptualise my description. The term *field* (Bourdieu, 1990) relates to Bourdieu's concept of practice theory as a form of social structure or organization epitomized as a space. Its *agents* (the people within it) have a social role and position within its structure as part of the *"historical process in which those positions are taken up"* (Hanks, 2005:72). The term *field*, therefore, has been used to describe a social phenomenon that allows concentration upon its specific features. In this study, its use has allowed me to consider the contexts in which informants were situated, the juxtaposition of roles of those within it, as well as the values (*capital*) and historical practice (*habitus*) held or displayed. Further consideration of these will be explored later. The term *practice* has been used to describe a theoretical understanding of the field.

The term *context* occurs constantly throughout the study. As an example, the understanding and focus upon digital technology use is affected by the context in which it takes place, both physically and perceptually. Context has been used to describe both a physical location but also the ideologies and practices which take place within a specific setting. The two are inextricably linked and influence one another in their use.

The term discourse has been used to indicate the "*mode of talk spontaneously chosen by the subject*" (Wengraf, 2001:7). At its surface level this is the utterance or vocalization, but in this particular study, I have also used it to include modes of communication, including the text

generated through electronic communication, gesture, intonation and facial expression with those with complex communication needs. It was the means by which meaning was constructed within social contexts (Cohen et al., 2007).

Finally, although I will discuss Multimodality as a concept within a consideration of Literacy (Chapter 2) and further in my interpretation (Chapter 7) there are terms used which require a brief understanding for clarification. The term *mode* has been used to describe the form of representation by which meaning is made (Kress, 1997; Kress, undated). In this study, it arises in forms such as the use of an image or object that illustrate a young child's initial representation of meaning or the recognisable facial gestures exhibited in communication. The *affordance* of mode permits the ability to change; to represent the same but differently. It allows a combination of meaning making rather than just being contained to one mode alone (Kress, 2003a). As an illustration, a material object may convey meaning through the sense of vision or touch. Meaning permeates and is not dependent purely upon the requirement of language. Uses of some technologies also permit *transformation* (Kress, 1997). These appear as changes across modes through the movement between image, text and speech on a screen. The term *transduction* (Kress, 2003a) is also important and is used as a consideration of the process of change between specific modes where one has been used to access the other. In this research the use of text prediction to create text and the use of speech recognition to produce text were two potential examples of its realisation.

2.2 Disability and Learning Difficulties

My research, therefore, used three strands of focus. The first of these; Disability and Learning Difficulties explored the educational contexts in which the key informants were situated and a consideration of the specific needs of the individual. As society has rapidly changed in terms of cultural, ethnic and economic structures, so has the consideration that children with disabilities and learning difficulties should be given the opportunity to be educated within the mainstream classroom (Frederickson and Cline, 2009). Yet it is only fairly recently in the UK (1980s) that those with difficulties with learning, sensory or physical impairment were once educated in segregated schools in the considered belief that these would be the best context to cater collectively for their specific needs (ibid; Walker and Logan, 2009).

However, the publication of the Warnock Report in 1978 and, subsequently, the Special Educational Needs Act in 1981 brought changes in legislation amidst a shift in societal perception and conceptualization of disability which heralded a move towards more inclusive practices. Again, this is a term that needs to be explored in greater depth in the following chapter but for the moment, the most important aspect to recognize is that these changes arose from a shift in perception from disability viewed as a medical condition and personal deficit, to one that

required social and cultural consideration. It resulted in a change of physical context for schooling for some, the concept of special educational need (SEN) and an early concept of inclusion that was:

> *"based on common educational goals for all children regardless of their abilities or disabilities: namely independence, enjoyment, and understanding" (House of Commons Education and Skills Committee, 2006:11)*

As a result, the late 1980s and 1990s, saw the closure of a number of specialist settings. Students who might once have attended schools catering for a specific subset of difficulty or disability were educated in mainstream schools. This change in legislation and practice led to further recognition of others with specific needs that resulted in an increase in numbers (Fredrickson and Cline, 2009). By the turn of the century, however, the closure of specialist settings had plateaued (House of Commons Education and Skills Committee, 2006) induced by a change in culture towards accountability and the increasing measurement of standards in mainstream education (Rogers, 2007). Emphasis was placed upon raising achievement across schools as the introduction and increase in standardized testing appeared and, subsequently, the production of league tables of school ranking. This had a negative impact upon inclusive practice (ibid) and held dire consequence for the perceived performance of schools and those with SEN within them. As Abbott wrote:

> *"At a time when schools can be closed and headteachers induced to resign as a result of a drop in test results, it is hardly surprising that many schools are reluctant to welcome students who find learning difficult". (2007:11)*

In 2005, critics of the Government's policy on inclusion, including Baroness Warnock herself, highlighted a number of issues. These included perceptions of enforced closure of specialist settings, dissatisfaction with the process for procuring statements where parents had to *"fight to achieve a better outcome for their child – and were still fighting"* (House of Commons Education and Skills Committee, 2006, Paragraph 147) and a lack of parental choice for schooling amidst the inadequacy of thought behind the whole concept of Inclusion and its negative impact upon some students (ibid). This was reflected within the House of Commons Report into Special Educational Needs, which in the midst of a number of statements highlighted:

> *"There is strong evidence that the existing presentation of performance data in league tables does not reflect well on many children with SEN and consequently acts as a disincentive for some schools to accept them" (House of Commons Education and Skills Committee, 2006, Paragraph 182)*

These debates have continued and more recently the Green Paper (DfE, 2011c), whose first measures were due to be introduced in 2012, began as my research was concluding. Amidst its proposals were the establishment of future policies intended to lead to better choice and consultation for both parents and students (DfE, 2012, Direct Gov, 2012). This background, with the spotlight firmly upon issues surrounding inclusive practice, was the setting for my research and the contexts of education for the students upon whom it has centred. The eldest, Ajay, was the focus of my pilot study and had experienced segregated schooling in his youth. Steve, at university, had previously experienced the differing policies of mainstream and specialist provision, whilst the younger two, Kate and Nick, were immersed in mainstream settings and inclusive practice, which needed to meet the diversity of their medical, social, emotional and educational needs.

2.3 Digital Technologies

The second of the significant strands of focus within this research was that of Digital Technologies. Again this demands a brief introduction, but a more in-depth consideration in Chapter 2 in order to explore the various types of terminology that exist to describe certain devices, technologies and their use. I have used the term Digital Technologies in my research to encompass a range of tools including those that others may refer to as specialist. These incorporated hardware such as computers, laptops, mobile and smart phones, tablet technologies, audio players and game consoles, or software and applications for both computers and phones as well as web-based applications, including social networking sites. Other terms to describe some of these, including that of Assistive Technologies (AT), infer more specialised types of digital technology support for individuals with specific needs.

My focus across a time span of thirty years was significant on a number of levels. The period has seen an emergence and development in the expectation and inclusion of technology into much of the curriculum that has been exacerbated by the rapid changes in the nature of technology itself:

> *"In many ways, the 1980s were the start of a rollercoaster of change in the use of IT in education. Schools climbed on the rollercoaster and are still riding it today. Teachers who were trained in an era before the role of IT was fully considered have had to come to terms not only with the technology's enormous potential, but also with the speed at which it is developing".* (Florian, 2004:23)

During this period a whole range of technology and associated tools were developed. These offered the potential to support learning for many, including those requiring additional support with literacy acquisition and development (McKeown, 1992; Rahamin, 2004; Hawkridge and Vincent, 1992). Teachers working in mainstream classrooms found themselves in the midst of

this proliferation and expected not only to keep abreast with technological developments but also make informed choices into their efficacy (Zeni, 1994). Thus this speed of technological change was an essential consideration since it affected all types of technologies, including those that offered specialist assistance and support to individuals with specific needs (AAATE, 2003) with no indication that the pace has slowed (Lee and Levins, 2012). This placed additional demands upon the classroom teachers in whose classrooms students with specific needs were situated.

On a personal level, this same period also coincided with my own embarkation into the *field* (Bourdieu, 1990) of specialist, and later inclusive education and saw the emergence of my own interest into the use of technologies to support the activities of students. The focus of this qualitative study, therefore, concerned the exploration of contexts in which the use of digital technologies, with a particular emphasis upon text prediction, was used for the construction of written text with students. Although it considered a number of different contexts, through the voices of individuals who worked with other students who used such technologies both in schools and at tertiary level, these have provided a background setting for consideration. Of greatest significance and focus, has been the voices of four significant informants because it was their use, motivated by their own physical impairment or difficulty with writing, that has resulted in this presentation of experience concerning the specific use of personally selected digital technologies.

2.4 Literacy

In order to consider the issues of writing difficulty specifically, I have considered this through the third strand of focus, the concept of Literacy itself. Again this demanded the in-depth consideration given in my Literature Review (Chapter 2). For introductory purposes alone, and to set the research into context, I have adopted a sociocultural perspective and made use of the term "*literacy practice*" (Street, 1993a) in my description of activity and context. The term Literacy itself required further exploration because of the complexities of understanding that the term invoked. However, what is important for the reader to understand was my consideration and focus upon students' literacy activities together with their attitudes towards any type of digital technology used within these. In terms of literacy participation, this was the availability of compensatory resources and differentiation of activity for the inclusion of all students, including those with physical, sensory or learning needs to engage in purposeful, independent activity. Throughout my thesis, this focus upon opportunity for independent activity has been an important consideration in relation to concepts of difficulty and disability.

3. Exploring the Use of Digital Technologies

This research, therefore, used these three stands of focus to look at individual issues with writing difficulty and the use of technologies which I have incorporated within the term of Digital

Technologies. However, early documentation purporting technological benefits within SEN and Inclusion (Louden et al., 2000), had maintained the term ICT (Information and Communication Technology) with little differential for the specific needs of any user (Becta, 2003a). Abbott (2007) used the generic term of Digital Technologies but redefined it within the realm of supporting e-inclusion, a terminology set within concerns of social inclusion and justice. I have also preferred this encompassing term but include within it a range of technologies that others might differentiate as specialist or mainstream in provision. The significance of this will become clearer as my thesis unfolds, when it will be evident that such differentiation was not clearly defined and that the advent of some newer types of technologies, and design principles in others, encompassed all users. Assistive Technology (AT) for example was a term commonly encountered in literature relating to technologies for disability issues but the definition varied according to the field of research and was not necessarily exclusive as the following definition outlines:

> *"item of software or hardware that has been specially designed to help improve access to a computer. AT is used by anyone with a health condition or disability that makes 'standard use' difficult or uncomfortable. It's also often used by people simply because it makes using a computer easier or more comfortable." (Ability Net, undated)*

It is a concept to which I will return because of the depth of deliberation it requires.

From a consideration of my findings, my thesis has focused upon two types of assistance potentially available through Digital Technology use: those that provide compensation and those that offer support. Both have the potential to enable independent activity by removing or reducing any barrier that inhibits productivity, in this case, specifically for written activity. The first of these, compensation, gives consideration to the "*affordance*" (Kress, 2003a) that the potential use of digital technology may provide to assist students with a difficulty or impairment and aids their independent ability to produce text. The second, support, focuses upon an assistive function to encourage and scaffold independent activity. It was important to consider these two specific issues of compensation and support (assistance) separately since these held potential implications for the way that any use of digital technology was perceived.

One of my interests focused upon when digital technologies were suggested or introduced. This involved the consideration of technology as a removal of barrier or difficulty (McNaught and Mill, undated) or one to support learning and to encourage independent activity. I was interested in whether schools effectively allowed students to fail, or at least underachieve and become demotivated with textual production for a period, before they considered the use of any type of compensatory measure. To understand access to digital technologies for the provision of

compensation, I have illustrated this with the following examples of visible and invisible difficulties.

A resource used for a compensatory purpose is evident when it relates to a visible indication of impairment; such as someone who has lost the use of his legs and uses a wheelchair for independent movement. Similarly, a pair of glasses or hearing aid will indicate a visual or hearing impairment. It would be unusual for anyone who required these types of devices to be expected to perform specific tasks without the use of their own specific, compensatory resource. As a consequence, the use of the compensatory resource enables activity.

This concept of compensation, however, appears to become problematic in contexts when the impairment or difficulty is either invisible or induced by environmental factors (Edyburn, 2006). Dyslexia, as *"a learning difficulty that primarily affects the skills involved in accurate and fluent reading and spelling"* (Dyslexia Action, undated), provides a useful example. It is one where there is no personal, external indication of impairment that might indicate difficulty. Yet, it is only when a specific task is expected in the environment; such as the ability to read a text in preparation for a classroom discussion, that indication of a student's specific difficulty with reading is evident. Verbal ability may not restrict participation in the actual discussion, but the student is unable to enter into it because he has been unable to comprehend the text he was expected to have read. With a compensatory measure, such as access to the use of a digital book or the use of text to speech software to hear the text, both participation and inclusion becomes possible. In this context, the affordance of Digital Technology potentially provides compensation for the barrier of reading difficulty.

So do students need to experience constant failure without being offered support or should support be made available as a measure that allows full, independent participation in the curriculum? To explore this I have considered Edyburn's (2006) concept of a "*Remediation v Compensation Equation."* Under this concept *"poor academic performance should be a trigger for assistive technology consideration"* (ibid:21) where greater emphasis is then given to "*locating resources, strategies and tools that support academic performance*" (:23). The equation illustrates, through the visual metaphor of balance and weight (Figure 2); the allocation of effort and activity for those with difficulty.

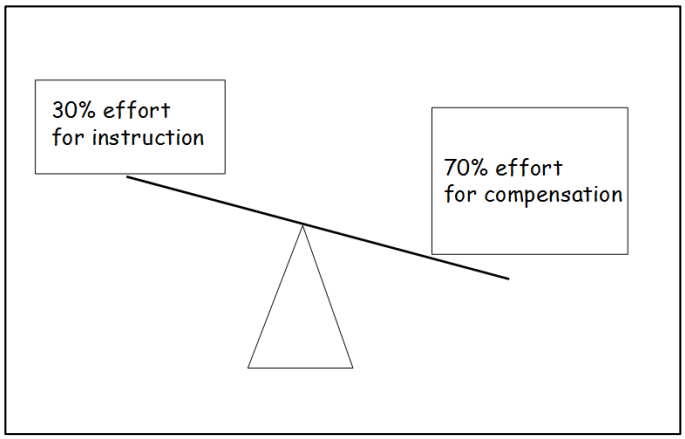


Figure 2: Remediation versus Compensation Equation (Edyburn, 2002)

Rather than continuing to prioritise all effort merely upon instructional type activities to address difficulty (assuming that these have even been provided), the equation shows a distribution of that effort being applied to curriculum activity with the support of compensatory resources. This removes a barrier to learning and makes the curriculum accessible. I will return to this in the following chapter by looking at a recent specific study within the UK that provided accessible materials (through digital technologies) to do this because Edyburn also drew attention to the confusion of double standards whereby it seems that: *"technology in schools should be withheld so that tasks are difficult but technology in real-life should be adopted whenever they make life easier"* (ibid:26). Therefore, looking to see if there was any availability of compensatory resource, including who suggested these and the timing of their introduction, was of significant interest.

4. Exploring Text Prediction

My early interest and research focus was initiated by my own professional use of text prediction technologies for both support and compensatory measures with students, although Chapter 3 will explain why this focus subsequently incorporated a much wider consideration of other digital technologies. Therefore I need to explain the term text prediction itself and why it was perceived as an effective measure for writing support (Newell et al., 1992a; MacArthur, 1998, 2006; Mirenda et al., 2006). Some literature suggested that the United Kingdom, United States, Australia and much of Europe possessed an inherent assumption that the use of digital technologies was both positive and enabling (Becta 2003a, 2003b, 2004), but my focus upon digital technologies for the specific purpose of encouraging independent participation, however, required a slightly different interpretation of the purpose and function of technology. I wanted to explore any influence or potential benefit of technology if it was considered as a compensatory or supportive tool for impairment, access or difficulty.

The word processor, like the typewriter before it, had changed the very nature of text production (Edyburn, 2003) and so text prediction software, therefore, might have been considered as just

one of many subsequent, available applications for supporting students with writing activity. Its development for students with a physical disability, as a means to improve the rate of entry of text by the requirement of fewer keyboard strokes (MacArthur, 1998), led to its use in wider contexts and not only targeted towards students with a physical impairment but those who had difficulties with constructing a written text (MacArthur, 2001). However, the question has always remained whether the implied efficacy of technology-supported writing can actually be measured and in what form (Edyburn, 2003). This study did not attempt to address this issue, but it did set out to explore the contexts in which digital technologies and text prediction were incorporated, and perceptions of its use with those who had tried, used or supported its implementation.

Before continuing, it is important to note that there are different types of text prediction and word completion technologies available. Some readers may have experienced various types of these applications when composing a text message on a mobile phone or when using a word processor. Some of these technologies require explicit instruction to facilitate entry of the word into the text, whereas other types use auto-completion where the word is finished as the first few letters are typed. Some applications can combine methods and modes (speech and text) of entry. Since its early use, there have been many advances in the functioning of these applications so that software products developed in most recent years have become increasingly sophisticated. As an example, the methods by which predicted words are suggested make increasing use of corpus analysis: that is an analysis of available dictionaries contained within the product itself or the user's own vocabulary. These can provide predictions of text not only based upon the entry of the first few letters of a word, as older versions once did, but also based upon the syntax and grammatical structure of sentences and phonetic spelling construction (e.g. sed for said, lefant for elephant).

Due to the improvements in the nature of these technologies, software developers have increasingly marketed text prediction software as a means by which any individual who has difficulty with text production, can engage in the writing process. Some of these are sold as text prediction packages alone, whereas others combine text prediction within a suite of tools including spellcheckers, research and planning tools as well as text to speech functionality, giving users the opportunity to configure and use the software for specific individual needs. New tablet technologies and smartphones also have some types of text prediction pre-installed that can be used with email, texts and subsequently purchased writing Apps (software applications on a tablet technology). Others can be purchased separately.

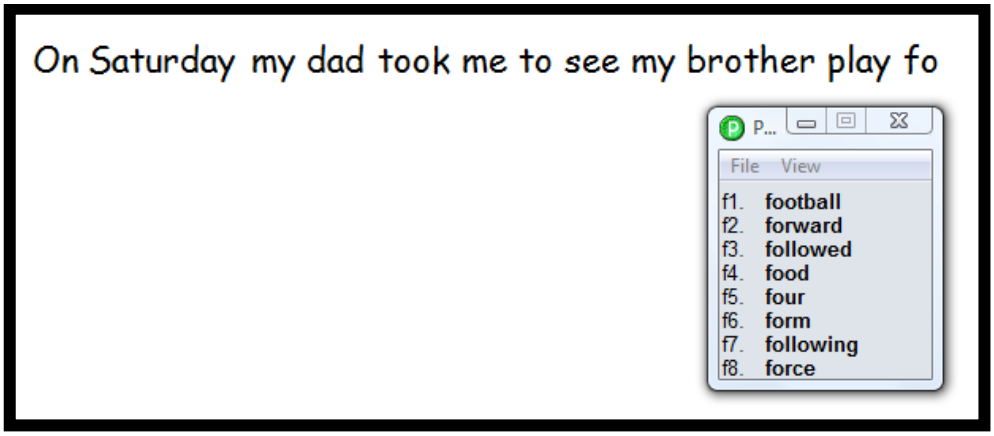


Figure 3: Example of text prediction used on a computer

Figure 3 illustrates an example of text prediction on a computer. Alongside the text, the predictive panel can be seen with a number of different words displayed. These are words suggested by the software as potentially suitable for entry at this point in the construction of the text. The student is able to hear any one of these words spoken by the computer, either by clicking with the mouse or hovering the mouse above the text. Instead of having to type the word using the keyboard, he is able to insert it either by selecting on the actual word in the prediction pane or the numbered function key e.g. F1 for football. Another facility within the software provides a text to speech facility that not only allows the predicted words to be spoken, but the complete text to be read back through speech synthesis, facilitating further text support. It is marketed as an application to support the writing process for some students by increasing text entry proficiency and speed, but also to support their written construction of text, spelling and syntax.

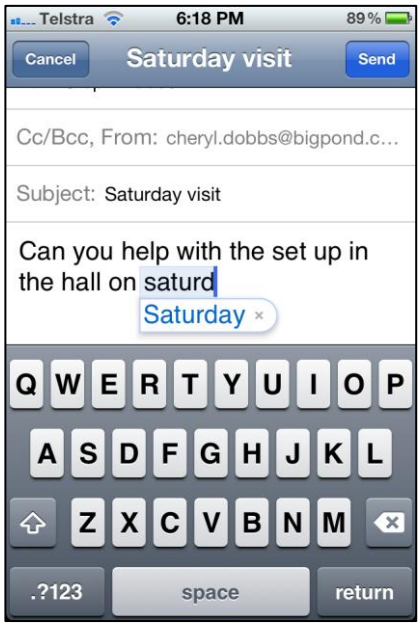


Figure 4 Example of prediction on a smart phone

Figure 4 provides another example of text prediction; this time on a smart phone, where the suggested word is added to the text under construction by tapping the space bar on the onscreen keyboard. In this study the term text prediction has been used to incorporate any type of technology that allowed the user to enter text with lexicon support. It included those of word prediction and the use of grids or word banks. Where auto-completion of words was used this has been indicated specifically. So this is what text prediction is, but why did I become interested in researching its use.

4.1 Using Text Prediction with Students

Early experience with the use of computers and primary aged children with learning difficulties and physical disabilities in the early 1980s, when the first computers began to make their appearance into UK schools, had a lasting impact upon my literacy teaching and particularly upon my approach to exploring and exploiting any affordance as one means to encourage and motivate children to write. Later, as a parent, I had greater opportunity to watch literacy development longitudinally, something that had not been possible when, as a classroom teacher, the start of each new school year generally brought a new cohort of children to work with. I watched as my own children learned to read and write, and subsequently other children that I worked with in out of school contexts with differing rates of development. I noted that the writing process was complex no matter the level of ability of the writer (Pollock and Waller, 1994; Graham, 1999, Myhill, 2009b). Interest was shaped by both reading and oral traditions (Myhill and Fisher, 2010) and was an activity which one needed to experience, engage with and practice regularly, in order to develop writing fluency. In my experience with watching my own children, it did not follow as a natural progression from any ability to read, or necessarily at the same rate as their reading. This was readily apparent as I watched my own children's enthusiasm for reading race rapidly beyond the text they could produce upon any page or screen.

At this stage, I have borrowed the useful analogy of equating learning to write with learning another language which Kress (1994) says shares some similar features. One consideration of this was the difficulties caused by the interference of the first language, in this case speech, upon the second (writing). For most of us, being asked to communicate in a new language, either through speech or writing, is complex. It requires opportunity to actively engage in the activity of language production in order to make gains in proficiency (Cummins, 2004). In comparison, if a student receives insufficient explicit structure or opportunity to engage in the writing process, he is unlikely to do so with enough frequency for it to develop (Westwood, 2003). As a result, inadequate or slow production is likely to result in a sense of failure, lack of motivation and self - belief that perpetuates into a recurring cycle (ibid) of negativity. These were important issues to consider and influenced my work with children in pursuing alternative methods to encourage

and motivate their engagement with text, in order to try to prevent or break such cycles occurring.

When my children were still quite young, we moved to Australia. Once there, together with a very small community of people, I began to explore and use software with children with literacy difficulties in different working environments, both in and out of school. This group learned from one another in our own "Community of Practice" (Wenger, 2006), a concept I will explore further later (Chapter 2) because of its implications for sharing and furthering knowledge. We engaged in workshops in schools and presentations at conferences, actively encouraging one another. Many of the students I worked with, like their UK counterparts, were integrated into mainstream schools and the gaps between their literacy performance and that of their peers could be considerable. There appeared to be little support provided for the teachers into whose classes these children were placed and although Individual Education Plans (IEPs) were drawn up, there were no statement processes or Special Education Acts with statutory procedures such as those that existed in the English system. There was also, rarely anyone within the schools I had contact with, who took on the supervision and co-ordination of these children's needs beyond the child's classroom teacher as the role of Special Educational Needs Co-ordinator in the English education system required. Amongst the children that I found myself working with in a private capacity, there appeared to be very little help for any student who had failed to learn to read or write once they had passed beyond the first two years of formal schooling. Some of the children took part in the widespread Reading Recovery program in their second year; an intensive program designed to give daily one to one literacy sessions based upon the work of Marie Clay (1993). However, beyond that, the only additional support that some of the students received was obtained through privately funded speech therapy services or private tutors for those whose parents could afford the provision. It was in the midst of this climate that I became aware of a technology called text prediction and began to explore its potential in my professional work supporting students.

My earliest experience using text prediction illustrated that good training and support was essential for the successful implementation of any new technology (Hegarty, 2004). Laura was in her first year of secondary education and her parents had purchased some expensive software that incorporated text prediction amongst its features to help her with the literacy difficulties she experienced. This was unusual because the students I worked with only bought software when it had been used in sessions and had proved beneficial for their individual needs. This ensured that they were supported until sufficient confidence and competence enabled them to use it independently. The software that had been purchased for her was not easy to set up or use and without available support, had caused frustration. It had been relegated to an expensive application on the tool bar of her computer that was not used.

There were a number of fundamental reasons why it was unused. There were problems with the initial installation, which combined with Laura's poor keyboarding skills and the failure of a supporting adult to set up a suitable sized lexicon for the predictive panel, resulted in an application that was not functioning adequately, thus increasing the frustration. Since the software was new to me as well, I had to learn how to use it at the same time as I worked with Laura. This was not my usual method of practice, since I liked to make sure I knew how software functioned before introducing it to others. If I wanted Laura to try to use it, as her parents wished, I not only had to overcome her negativity towards it but also work with her to improve her poor reading and writing. As Westwood (ibid) earlier described, the recurring cycle of negativity and lack of writing, illustrated just one of the problems that I encountered when working with students like Laura. It required consideration of ways to address issues with literacy that had already severely impacted upon feelings of frustration and confidence (Augur, 1995; Ott, 1997, 2007; Pollock and Waller, 1994; Thomson, 1997b).

I also discovered that even if Laura learned to use the software effectively, it was unlikely that it would ever be used in school. At the time (early 2000s), students in Laura's school rarely used computers outside of a computer laboratory and even there, only generic software was available for writing activities. Laura's father and I suggested to the school that she could try to use the software, now installed successfully on her laptop, but this was met with resistance by the school itself, who could only see obstacles to the suggestion. There were the obvious issues of security and lack of immediate availability since laptops, at that time, were not as common as they are today. More importantly the school, which ultimately influenced Laura's perceptions, decided that if she were to use it, she would appear *different* to her peers. Understandably, this deterred her and so she preferred to only use the software at home. So Laura persisted with brief handwritten texts for school that rarely reflected her true understanding or vocabulary ability because she was reluctant, and too embarrassed, to use words she could not spell. She had very little confidence in her own ability and became increasingly negative and unhappy about most aspects of her school life.

Laura's use of technologies was far more involved than this thesis allows but she persevered using the technology in sessions with me in an out of school context and eventually learned to use text prediction and some of the other features of her software during our weekly sessions and, subsequently, used it for more of her homework activities. However, she never fully used all the other functions of the software's capabilities. I always felt that had the package been introduced well initially, with someone to support both its technical application and who had tailored it specifically to Laura's needs and requirements, the whole scenario might have been quite different. However, the episode highlighted the fact that individuals need to use software in different ways and need to configure it to suit their own individual style of working. They also require some form of mentoring or facilitation in the early stages of use.

Laura used the text prediction part of the package quite differently to how I had perceived its design. Instead of selecting a word from the suggested list, she used it as a type of aide memoire from which she could copy the correct spelling. She preferred to keep the prediction pane static and well away from the construction of her text, not following the cursor. She used it in the way that she wanted; so was happy to use it. Her rate of text production began to increase as she regularly communicated with friends over MSN (Microsoft Messenger), an early forerunner of social networking. She saw no need to use text prediction for this task as her poor spelling did not matter when everyone else abbreviated their speech into contracted, but recognisable, formats. However, with her increasing engagement with this communication facility, she began to write with greater frequency and became more proficient, accomplished and quicker using the keyboard. This, in turn, influenced her use of the computer and she then started to use it more regularly for homework activities, producing text that she was happy to hand in, as opposed to the poorly formed, error riddled papers that had caused earlier frustration. The self-perpetuating cycle of failure seemed to be slowly beginning to crack (Westwood, 2004).

This vignette of Laura's use is included here as it illustrates some of the issues that I wanted to explore in my research. These included an exploration to discover if similar software was used by students and if so, why. Importantly, I was interested in where it was used and how it was incorporated into contexts. In Laura's situation, the software was only in use in out of school practices but it still appeared to impact upon her literacy behaviour. Although she did not use the software for her social networking, the increased use of the keyboard helped her proficiency and typing speed, which resulted in her using the computer for homework activities. She then used the prediction software to support her writing and spelling. Each impacted upon the other and a more positive cycle was set into motion.

Laura, therefore, provided me with my first introduction to text prediction technology. It influenced my thinking and encouraged me to investigate the wide range of packages that existed and the differences between them. I hoped its provision might encourage other students that I worked with to actually engage in writing activities more frequently and let them achieve a sense of success with the ability to produce text without adult support, not only in our sessions, but ultimately at home and at school, and so I began to explore different types and the differences between them.

Figure 5: An AlphaSmart, a small low-cost, portable keyboard and screen

During 2003, I began to use an AlphaSmart 3000[1] (Figure 5) with students. It offered a small, cost-effective, portable keyboard onto which another type of text prediction software had been added. The same application was also available for use on a desktop computer, but with the added bonus of synthesized speech. This software was quite different and much simpler to use than the prediction I had used with Laura.[2] What became increasingly apparent through this experience was the progression in suitability of the different types of software and packages that required matching to the needs of the user. An essential feature appeared to be the availability of speech feedback, which was absolutely vital when a student could not read the predicted (suggested) words.

Some students felt that one package was too slow for their needs and interfered with their writing. A parent of another student expressed concern that the use of text prediction made writing all too easy and would not encourage any improvement in her daughter's poor spelling. I listened with interest to these comments as I became increasingly interested in its use and how the students used it. However, the children that were to surprise me the most were the very youngest in their first years of formal schooling. I only saw them once a week but they used the technology in an intriguing and exciting manner, since it revealed to me new opportunities for the way it might be used with emergent writing.

I should emphasize that up until this point I had only been using word prediction as a support intervention for those who were struggling with writing, whereas these younger children

[1] AlphaSmart is a generic name for a particular type of portable keyboard
[2] Some of these experiences were later published on an Australian website and can be found in Appendix A.

showed me that its use was equally beneficial in offering support for children beginning to learn to write. These children had already experienced good quality first teaching (Rose, 2009a) in an out of school preschool program of early literacy preparation and were eager to move into regular, written practices. They did not have to use text prediction, but I watched them as they chose to do so, when even the least confident amongst them was as enthusiastic about wanting to write as his more competent peers.

In these sessions any text production began with a form of visual or tactile imagery; such as the use of puppets, photos or the child's artwork. Each child would then choose any of the technologies that were available in the room. These included portable handheld computers, including the AlphaSmart, a talking desktop publisher and two types of text prediction that were relatively simple to use. Traditional writing implements such as pens and pencils, including those of differing textures and colours also captured their attention. Grids from Clicker 5 (see Figure 6), a grid based text predictor, were also available but, as supportive as these grids were, they needed to be set up with suitable vocabulary before each child started writing. They offered excellent support and structure for specific vocabulary that had been previously entered, but they did not offer the immediacy of vocabulary or the spontaneity of subject content that the children demanded.

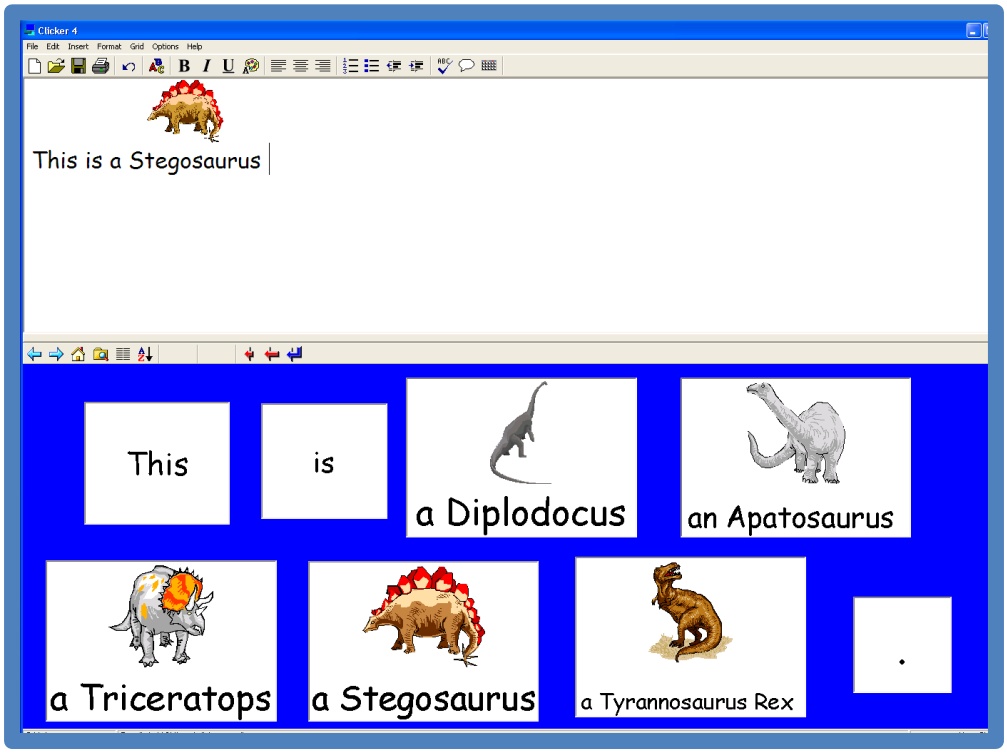


Figure 6: An example of writing using Clicker 5, a grid based text predictor and writing support

The children chose for themselves how and when they produced text. Their choice was not dominated by digital technologies alone as they sometimes preferred to use the pens and pencils or even combine various tools. They seemed to use the technology in what was almost a type of

construction of play that I have described in greater detail in Appendix B. I later read that if the program was to be used with younger children, it was a good idea to start with cloze procedure type activities (Nisbet et al., 1999). We did not, but I think the children learned more about writing and using the software through the exploratory nature of their production. They were motivated to write by the open nature of the tasks that they initiated. Most importantly, they engaged in writing for their own pleasure, not as a means to an end or because a task had been set for them; a difference between texts demanded and created at school and those away from it as Bissex (1990) noted in her ethnography based upon her own son's emerging literacy. The whole process was about learning to write within a supportive context and we all gained pleasure from doing so. I never had to actively encourage anyone to join in with the process. The experience suggested that the inclusion of text prediction in early text production activities might have more to offer than just supporting those that struggled.

So, my interest in text prediction was based upon my early experiences of using it to support written activity, but it was set within a context that was able to explore different types of technologies in a small and supportive setting. It did not have to conform to any schooled environment. In contrast, my research was set in an entirely different context. First of all it took place in the UK, when I had returned to live again. Having been away from this educational environment for a number of years, it was still familiar in terms of pedagogy and some curriculum stipulations. This was beneficial in terms of being able to consider contexts from different positions but it still required learning about changes in practices regarding technology use, the place of Literacy within the National Curriculum and the requirements of Inclusion policies and practice; all of which had evolved substantially in the twelve-year period of my absence. It also required thought and justification into how this topic could be explored with both meaningful and practical consideration and required an exploration of methodologies that were flexible and accommodating as my knowledge of these contexts emerged. Importantly, it started with a fixed intention of exploring the use of text prediction with young children.

5. Summary

This chapter has introduced my research setting and its focus upon the three strands of focus: Disability and Learning Difficulties, Digital Technologies and Literacy and why these involved concepts of Literacy, an understanding of what constitutes Difficulty or Disability and the importance of context in the consideration of Digital Technology use. The chapter has also outlined the thesis focus upon four specific individual stories of exploration and use, set amidst a wider consideration of practice from both development and those who support individuals in their use of technology. It has highlighted the way in which the three strands have been focused upon but have also been considered as woven throughout my research, in order to consider the use of digital technologies to either offer compensation, or to support, independent activity. I have described how my own observations of text prediction use interested and initiated my

research focus and how this influenced the early stages of my exploration. Now, in order to place all of these considerations into context, the literature surrounding these strands needs to be explored in greater depth.

Chapter 2: Literature Review

1. Introduction

In order to understand the contexts in which students potentially used digital technologies to support the difficulties they experienced with writing, I have used the three strands of focus; Disability and Learning Difficulties, Digital Technologies and Literacy. These needed to be explored in greater depth in order to reach a deeper understanding of the arena in which my research was set. Each strand involved a consideration of issues that I have explored through specific literature and held the potential to impact upon any understanding of the other two. Specific terminology existed within each, both in terms of literature and practice, which may have been understood quite differently according to the context in which they were set.

For practical purposes, and to try to keep clarity in what became increasing complexity, I have dealt with the three strands separately. I have extracted and focused upon specific, relevant elements that I considered illuminated my research focus in order that these could be brought together to then offer a collective background towards understanding the specific needs of the student and writing difficulty. In this way the use of digital technologies and specific difficulties could be better understood. Therefore it is the deliberation of each strand, but then the combined focus of each, which holds significance for my research. However, due to the complexity of the issues some contained, I have heeded the advice of Wolcott (2009) in not presenting all of my literature in one place but taken the decision to explore some considerations later in order to focus upon specific implications as they arise in subsequent chapters. The final section of the chapter explores the literature associated with text prediction specifically and the difficulties associated with doing so.

2. Disability and Learning Difficulties

In this section I have focused upon four specific concepts which held significance for my research and which emerged as key considerations regarding Disability and Learning Difficulties. These included the terminology ascribed to difficulty and disability, the difference between any understanding of Integration and Inclusion, the use of Teaching Assistants as a means of provision for supporting students with specific needs in schools and the evolving perception of disability brought about by changes in cultural and social attitudes. I have begun by considering the terminology itself.

2.1 The Issues of Terminology

As briefly outlined in Chapter One, the terminology for describing students and their specific difficulties required careful consideration, since I have already alluded to the fact that difficulty,

or its degree, can be constructed or influenced by context. The term Special Educational Needs (SEN) appeared in my introduction as a concept set amidst an historical perspective and originated from the shift in focus from educating children in separate facilities according to their impairment or difficulty, to a move towards more inclusive practices in the UK (Fredrickson and Cline, 2009). However, the emphasis upon any description or use of a specific term, including SEN, may be as problematic today as the out-dated terms for individuals with specific needs that we no longer deem acceptable to use (Digby, 1996). Even the term SEN used to encompass impairment and learning needs is regarded, by some, as attaining to an earlier medical model of disability (Abbott, 2007).

The quandary that surrounds the appropriate use of title, label or description originates from changing attitudes, the diversity of society and debates between different theoretical approaches (Frederickson and Cline, 2009) and, sometimes, linked to funding programs themselves where the terminology affords material provision (Louden et al., 2000). The trend now errs towards the use of terms that encompass both inclusion and diversity. It is exemplified in titles that local authority education services adopt when reconfiguring and renaming themselves such as: School and Pupil Support (Birmingham), Additional Educational Needs (Kent), The Early Years Child Care Service Inclusion Team (Herts). However, the term SEN still persists within some authorities at the time of writing (2012) and remains in more recent literature such as the consultation of the Green Paper: "Support and Aspiration: A New Approach to Special Educational Needs and Disability" (DfE, 2011, 2012).

Other terms associated with SEN included Learning Difficulties or Disabilities (LD) and Specific Learning Difficulties (SpLD). Any consensus on terminology was also complicated by the disparity of use by the range of professional backgrounds, all of whom brought their own differing opinions and theoretical backgrounds (Louden et al., 2000). However, like the terminology of disability, the concept of difficulty could equally be attributed and created by the context in which learning took place (Abbott, 2007; Rose and Meyer, 2000) where onus is placed upon a perception of individual deficiency rather than the inability of the context to make accommodations for those with individual and specific needs (ibid). To fully understand the nature of any of these, one had to understand an individual's interaction with the context (both cultural and spatial), as well as the demands of the activity itself (Fredrickson and Cline, 2009).

2.2 Integration and Inclusion

I have already pointed out that a shift in education practice during the early 1980s saw a move towards the integration and inclusion of children with specific needs into mainstream schools, when they would once have been educated in specialist, separate settings. Sometimes, these two terms of integration and inclusion have been used interchangeably with little distinction between

any of the fundamental differences that exist between them (Abbott, 2007). Yet this difference is of major significance in the way that students are involved or included in educational settings and activities.

Integration may involve little more than making a small number of changes or adjustments that allow for the presence of individual students with needs, such as adding a ramp to a building to allow wheelchair access. In contrast, the concept of inclusion requires more fundamental changes to its approach, including shifts in policy (ibid). It requires methodological and organizational changes in order to benefit all children that *"encourage developments towards a much richer overall environment for learning"* (Ainscow, 1995:2). These types of considerations impact upon the whole school and its approach, its philosophy and practice, and affect all of the children within it, not just those with specific needs. Therefore, making reasonable adjustments to the learning context in order to cater for the needs of all students would be encapsulated within this concept. In an era when students of all abilities are present in mainstream classrooms, the practice of Inclusion requires that a consideration of the full range of specific needs is taken into account in order to ensure that all students are given the opportunity to participate fully in classroom activity.

2.3 Use of Teaching Assistants

Another important issue regarding consideration of specific needs involves allocation of resources. In schools, this includes the provision of Teaching Assistants (TAs) who have been increasingly used as part of the support model for students with specific needs (Blatchford et al., 2010). In 2009 the number of TAs accounted for 25% of the total school workforce in the UK (ibid), but instead of offering support to relieve teachers of routine clerical tasks as their presence had intended, more support staff spent "*much of their time in a direct pedagogical role, supporting and interacting with pupils" (ibid:3)* which involved elements of teaching (Frederickson and Cline, 2009). TAs have become an important component of support and provision for students with SEN within mainstream schools and in contrast to providing *"additional support",* they now provide *"an alternative form of support" (ibid:2).*

This holds serious implications; not only for the expectations demanded of them but also for the students in their care regarding who instigates the expectation and thinking behind activity and teaching. The issue is fundamental. Some TAs now have a frontline pedagogical influence in roles that are not clearly defined, but also more likely to lead to an outcome where students who are supported, performing less well than those who receive no support whatsoever (Blatchford et al., 2012). This issue, therefore, raised another important consideration in this research regarding the influence of TAs in terms of literacy activity and expectation as well as their involvement in the use and support of digital technologies and their implementation. It also held significance for any expectation of student autonomy.

2.4 Evolving Concepts of Disability

The term disability must also be addressed specifically so that the types of technologies discussed are better understood. The term 'Assistive Technology' (AT) was to be found amidst the literature concerning technology for individuals with specific needs, invoking different definitions and descriptions for it. One was included in the previous chapter, but another describes AT as "*any product or service designed to enable independence for disabled and older people"* (User Group Consultation at the King's Fund, 2001). This definition emphasises assistance and compensation for age and disability. However, in order to set this into context, I also need to briefly explore the terminology and understanding of disability, as a term of reference.

The 1970s and early 1980s represented a time when the concept of disability was perceived under a medical model where those affected were seen to be restricted by the limits of their bodies and their conditions (Roulstone, 2010). This period focused upon the deficits and difficulties of an individual's physical impairment and the negative impact of these upon achievement opportunities and quality of life (Roulstone, 2012). The period was also one where the voices of impaired individuals were notably not represented (Charlton, 2000). Instead, views were expressed and policies determined for individuals by professionals and researchers without any consultation of the individuals themselves. A notion of helplessness persisted in literature and tone, reinforced by the fact that many people with disabilities led segregated, separate lives (ibid).

The concept has since undergone significant changes. Disability has moved away from this earlier medical model of deficit and dependence, towards one of social and cultural consideration (Zangari et al., 1994). It is one that has been instigated by changes in society and perception, and not least from what has been described as a disability civil rights movement (Charlton, 2000) represented within the slogan 'Nothing About Us Without Us'. In reaction to what was once seen as oppression, this movement has worked towards

> *"an epistemological break with the old thinking about disability and demands an end of the cycles of dependency into which hundreds of millions of people with disabilities are forced".* (ibid:5)

Education and employment is an important consideration towards full acceptance and participation in work and community. This concept, illustrated in the statement from the United Nations Convention of Rights of Persons with Disabilities recognizes that:

> *"disability is an evolving concept and that disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others." (OHCHR, 2007)*

Yet, in developing countries, disability and poverty are still considered to go hand in hand with a lack of access to education and work (Borg et al., 2009). Thus any concept of disability is not one that can be considered as fixed or attributed to a person, but determined by the context where " *a gap exists between individual capabilities and environmental factors, and the gap restricts the quality of life and hinders fullest exploitation of the individual's potential in society*" (AAATE, 2003). One way to change context might be with the provision of additional resources to either compensate for specific need or to assist with any difficulty and leads into a consideration of the use of digital technologies to offer potential support or compensation.

3. Digital Technologies

As in the previous section, I have focused upon specific aspects within this strand of Digital Technologies to explore issues that require more than the earlier brief introduction. Again, I have begun with the essential elements of terminology in order that I can focus upon key issues such as Universal or Inclusive Design. These were essential to consider, not just because they applied to technologies, but also to learning. This section also gives consideration to the evolution of technology from specialist interest to mainstream markets.

3.1 The Issues of Terminology

It has been suggested that the role of technology has an important role in changing the perception of society to disability issues as well as in making provision for the needs of individuals (Alper and Raharinirina, 2006; Draffan et al., 2007). I have used the term Digital Technologies in my research because of the broad categories of technologies that I have included, but amidst these, as I have already highlighted (see:24), some might have been labelled as Assistive Technologies (AT) within other contexts. In rehabilitation engineering, as an example, the term is *"primarily associated with either short-term recuperation from injury or illness, or long term functional support"* (Newell, 2003). Under a medical model, AT offers affordance to: *"either alternative ways for people to do things or provided an augmenting of physical deficits"* (Roulstone, 2010:2) and involves *"using tools to augment and extend ability"* (Edyburn, 2006). These descriptions may apply to technologies such as Augmentative and Alternative Communication (AAC) for example, yet awareness and research has lead to a reconsideration of terminology in the same way that cultural and societal shifts have changed those of disability.

The terminology of AT is used, in some contexts, to describe some of the many forms of writing support technologies such as: speech recognition, text prediction and text to speech facilities. These could be viewed under a Vygotskyan concept of scaffolding as a "*technological scaffold*" (Price, 2006:22). However, Roulston (2010) argues that the term perpetuates the notion that technology assists the disabled individual towards an image of normality in its ability to *"augment, assist and adapt" (ibid:3)* and that under an enlightened model of disability, different terms are required. Terminology is therefore complicated yet, as Zangari et al. (1994) point out, maybe it is simply the fact that we do not have terms in English that are "*acceptable or desirable equivalents"* as may appear in other languages.

At the start of this thesis, I referred to the consideration of text prediction as both an assistive tool when it was used in some contexts but a mainstream product with its availability on phones and within word processors. It is one of the reasons why I have continued to incorporate it within the generic title of Digital Technologies. However, in the UK, but also widely in the US and Australia, it is included under the terminology of Assistive Technology. Therefore, due consideration is given to Roulstone (ibid) for his suggestion that the term Assistive Technology is restrictive and not only requires a new type of language to accommodate the changing and evolving nature of technologies, but also the type of accessibility they provide. He suggested that the term New Technologies is not only more socially aware as a term but that it incorporates technologies that allow access to online communities and spaces that restrictions of physicality once precluded. These technologies, including access to the web, allow the individual a presence for both communication and access into places and communities, through online interaction. Thus the potential affordance to a *"subversion of space, time, physicality, corporeality and physical dependence"* (ibid) invoke important elements to be considered in terms of disability and have particular relevance here, both in terms of the research process itself, but also the lives of some of the informants who have contributed towards it.

I have earlier described the technologies referred to in this study as potentially offering compensation or support, because these may hold the potential to lead to independent activity. Abbott (2007) in his consideration of Digital Technologies described such technologies as having three distinct functions: to train or rehearse, assist learning and enable learning. Where I have used the terms of compensation or support, I have used these to illustrate concepts of enablement and assistance, not in any way that suggests personal deficiency, but as a means to either surmount barriers or to remove them altogether.

The inclusion of available resources within an Inclusive environment implies that availability, support and compensation go hand in hand with concepts of accessibility; therefore the use of the term Digital Technologies avoids adding further to the complexity of terminology as well as being inclusive. It also helps with the blurring of boundaries that developments in technologies are beginning to invoke and have arisen further as time has passed throughout this research

period. My interpretation of such resources, therefore, is not meant to restrict use only to those who have a physical impairment or a specific need within any learning context, but as an available resource for anyone to use if it is needed. My concept of a compensatory resource, therefore, alludes towards the inclusivity and availability of resources, digital or otherwise, which balance or distribute accessibility to anyone that finds them of benefit and leads towards a consideration of Universal and Inclusive Design.

3.2 Considerations of Universal or Inclusive Design

I have earlier referred to the use of the term Assistive Technology being perceived within a medical or deficit model of disability, and have emphasized my personal preference for the general and inclusive term of Digital Technologies. Yet another issue to consider with both the title and the types of products within this terminology was for whom such products were marketed, particularly when this population may not have had influence upon their design (Newell, 2003). Consideration of another concept, therefore, that of Universal or Inclusive Design, applied to some of the technologies used in this research, as they did not adhere to any model of assistive or specialist technology, but attributed to a design for use across populations.

The concept of Universal or Inclusive Design can again be examined by stepping away from technology for its consideration. Steps into an older building may require adaptation in order to allow wheelchair access. One consideration would be to build a ramp, but its very existence also allows access for anyone else who would benefit. This is an example of accessibility that has been retrospectively added by the addition of a feature or customization to afford access. In contrast, if the building were to be designed in the UK today, the architect would need to adhere to the Disability and Equality Act of 2010 and incorporate access into its design. Thus features such as ramps, escalators or lifts would be considered part of planning as an example of Universal or Inclusive design and not as an additional feature.

This concept is sometimes called Design for All (AAATE, 2003) and ensures that utilities are incorporated into a product from the initial design, not as any additional feature added retrospectively or requiring another product, or step, to access the original. Resources that incorporate this design mean, therefore, that they are accessible for anyone to use (inclusivity). They may have built in options that can be turned off or on, or used only when necessary, but they provide access for anyone (Rose and Meyer, 2000). Universal therefore, in this consideration, does not imply one, but multiple. As with concepts of Literacy and Disability, the concept can be viewed along a continuum, which places such products, as well as those which are labelled ‘assistive’, not as separate domains but as one (AAATE, 2003). Some emerging technologies and software have intentionally incorporated this concept into their design. The tablet technologies and smart phones used by an informant in a following chapter, as an example, included such features. What will become of interest, and it is too early for the pace of research to

have yet fully considered (Wilson, 2012) is whether the features that are included are those that individuals necessarily require or whether their incorporation places additional demands which will create new barriers.

In order to facilitate my understanding relating to the concept of Universal Design, I found it useful to consider this in relation to the emergence of specific products relevant to my research. Therefore, exploring the contexts in which individuals have used digital technologies for their writing difficulties drew attention not only to the question of specialist or mainstream technologies, but how and to whom particular products were marketed. Mindmapping software provides a useful example since it is increasingly used in business as a productivity tool, but was once the domain of the dyslexic market place (JISCTechDis, 2012).

The subsequent use of technology beyond its original market focus also applies to the emergence of text prediction on mobile phones itself. This evolved from a development, in the late 1960s, of an early system of text entry to enable the conversion of the Japanese scripts katakana to kanji on a typewriter (IEEEGHN, undated; Doi and Lei, undated). As a mobile phone technology, it has subsequently evolved through various permutations beyond this pioneering focus. In the 1980s it was used as a means to allow deaf people to communicate over the telephone network using the telephone keypad and in 1985 was patented as the predictive text 'T9' as a "*disambiguation technique*" [3] on mainstream mobile technology (Judge and Landeryou, 2007).

[33] The term ambiguous keyboard or keypad being one where each key has more than one character, letter or symbol assigned to each button, thus creating uncertainty when a key is pressed (MacKenzie & Tanaka-Ishii, 2007).

Figure 7: Mobile Phone Keypad

A short description of the T9 system is useful here, because it explains the transition to the types of keypad that now exist on smartphones. The T9 system used letters on the nine keys of the keypad (see figure 7), whereby each key could be used to produce a number of possible symbol combinations and made use of predictive technologies (a disambiguation process) to select the most probable word for composition (Judge and Friday, 2011). This allowed users to rapidly create words (once they had understood the concept), through a single key-press and contrasted to earlier versions that had required multi-taps. However, it did not offer prediction (ValidConcept, 2009). This concept of disambiguation was later adopted into switch devices and scanning for individuals with physical impairment and for AAC, although for the latter it only remains in devices considered as 'high tech' (Judge and Landeryou, 2007). Today, the term disambiguation is rarely used and the process has been superseded by smartphones that incorporate text prediction through a touch screen interface and an onscreen, multi-touch keyboard (Judge and Friday, 2011). I have drawn attention to it here as this shift from a disambiguation process to the multi-touch keyboard impacted upon the way some devices could then be accessed.

This transformation in the scope and use of some types of technologies, therefore, may not necessarily be merely the result of advance in the technology itself, but the result of a shift in awareness. This may also be attributed to the change in demographics of the user (Newell, 2003); another indication of social and cultural shift. Digital technologies are not merely associated with young people and, importantly, society has an aging population. All of us, not just those who have some form of specific need today, now have the prospect of better care and

medical opportunity that may increase and extend our life expectancy. It will also increase the potential for age-associated products to meet those needs (ibid).

We will also continue to have interests. Older users, who may once have never thought of using any form of digital communication device, other than perhaps a landline phone or television, are beginning to recognise the potential affordance of mobile devices. A 92 year-old relative struggles with the conventional buttons on a phone yet he can now use, with assistance, digital technologies to communicate through email and online telephony. Yet, the slow pace of research has yet to catch up with these emerging examples of older users using online communication tools and social spaces with tablet technologies and onscreen interfaces. Some do find them simpler to use than conventional keyboards on computers as their fine motor control becomes more difficult (Sheldon, QIAT online forum, 2012). Therefore, for the consideration of my research, Universal Design was significant for both purpose and the specific needs of the user.

3.3 Applying Universal or Inclusive Design to Learning

Although this next focus could equally have been introduced earlier within disability and learning difficulty, it required knowledge of Universal Design as applied to digital technology use and illustrates why the three strands upon which I have focused had to be unpacked separately, but need to be viewed collectively and through one another. The concept of Universal or Inclusive Design is not exclusive to material objects, since it can also be applied to learning. Universal Design for Learning (www.cast.org) whose conceptual framework is generally attributed to Rose and Meyer at the Centre for Applied Special Technology (Edyburn and Gardner, 2009) is represented by:

> *"a set of principles for curriculum development that give all individuals equal opportunities to learn." (Cast 2012)*

It incorporates the fundamental principles of:

- The presentation of information and content in different ways
- Differentiating the way that students can express what they know
- Stimulating interest and a motivation for learning.

The ideas within this concept do not pursue the idea of producing a one size fits all approach to learning or the curriculum, but firmly adhere to the principles of a learning environment being created that is accessible to all by the provision of differentiated resources (Rose and Sethuraman, 2000). This point is salient and is central to the notion of consideration of the context in which a student is situated. If the situation is to be inclusive, it needs to offer the

affordance to participate fully within it. This contrasts with the notion of a student having to use assistive technology to access an inflexible or inaccessible curriculum (Rose and Meyer, 2000).

Therefore, to consider this in regard to digital technologies, I refer back to the concept I introduced earlier regarding the provision of compensatory resources and Edyburn's Compensation v Remediation Equation (see :25). If digital technologies were included as a consideration of need because of their potential to provide access to learning for all needs; using as examples, a screen reader for a student to hear text, a diagram to represent ideas rather than description and in consideration of the focus of thesis, the production of meaning through choice of mode, how could these concepts be linked? One way is not to regard the incorporation of resources as compensatory, but merely making them available to anyone that needs or wants to use them in any context; by the creation of an inclusive environment.

However, it is important to note that Inclusion requires more than just availability of resources. Returning to my earlier point, Inclusion requires a change in philosophy, methodology and organization. It is not just about the provision of material objects in a learning space but also concerns ethos and practice. Integration involves including a diverse population but Inclusion involves people who have adopted an inclusive ethos and practice. It takes place in an inclusive context where the availability of resources (which may include digital technologies if they are useful) involves a consideration of design (Universal Design) that anyone can choose to use but also encourages personal autonomy.

Therefore, before I leave these thoughts of Inclusion and Design for Learning for a while, I need to add one final consideration. It relates to the word design itself, since an appreciation of design, as well as purpose, may help to provide one of the considerations or influences in the preferences of technology used or whether they are used at all:

> *"The difference between 'need' and 'want' has very important effects particularly regarding the aesthetics of equipment. Those things we want are usually beautiful – in the eyes of the purchaser at least. Those products which it has been determined -by others - that we 'need' do not have the same requirement to be beautiful as their functionality is considered to be of utmost importance. However this need not be the case. There is no absolute reason why assistive technology products should be ugly." (Newell, 2003:174)*

I draw attention to this because it occurs later in my consideration of technology use when some users perceived their original technologies to be cumbersome, both in design and in use and they have lain redundant. Access and alternative tools for computer use, some AAC devices and laptop computers may not appeal to all users and this may affect their uptake. I will just float this

consideration amidst these others for the moment, but I will return to it, because Inclusion and emphasis upon an accommodation of need may not only be about function and purpose. It is also about perception; about how an individual feels about the technology they choose to use or need to use. A consideration of context is not merely about examining a physical space, but also the discernment of the user.

4. Literacy

> *Most people, except you reading this book, rarely think about being literate. Once we have learned to read and write so that these seem natural things to do, we take our literacy for granted (Meek, 1994:1)*

The third strand of focus that I need to consider involves the very issue of what is understood by Literacy because I have already talked about literacy and writing difficulties without any real explanation or attempt to examine it as a concept. Yet Literacy itself is a questionable commodity and concept, with specific terminology and emphasis depending upon the discipline in which it is set and the context in which it is being used. Meek points out that those of us that are literate are fortunate enough to be able to take it for granted, but that is easy when we have never struggled to do so. It is, therefore, important to emphasize that it is *not* a universal phenomenon but one that has been given a socially constructed value that may not be as significant in all cultures (ibid, Rogoff, 2003). It is also a recent expectation (Meek, 1994; Millard, 1997).

As a term, the word Literacy is often used both in and out of educational contexts as if there is an assumption of a universal, common understanding. The National Literacy Trust, for example, define it as: *"The combination of reading, writing, speaking and listening skills we all need to fulfil our potential"* (Jama and Dugdale, 2012). However, not only is the term used in a multitude of contexts that differ in complexity of explanation but is also open to misinterpretation. Literacy has different meanings according to differing paradigms of understanding; most of which continue to be the focus of debate and continuing shifts in perspective. This section of my literature review, therefore, attempts to set the scene for an understanding of Literacy as a concept, before considering the difficulties that some individuals encounter with it and particularly with writing itself.

4.1 The Issues of Terminology

First of all, it is of interest to note that the word literacy does not exist in all languages and that it varies according to the field of interest (Kress, 2003a). Translation of the term epitomizes the discrepancies and differences in notions of literacy that exist and are used in society. When the term is used in pedagogy or curricula documents in schools in England, such as within the statutory program of study for English (2011); it is used in reference to some form of physical attainment: *"attainment target level descriptions"* (DfE, 2011d) that define stages that children

are expected to achieve. Within this cognitive psychological perspective, literacy is viewed as "*autonomous"* (Street, 1984) since it conforms to a concept that is viewed as developmental, with an assumption that the steps of acquisition are sequential and common for most children (Larson and Marsh, 2005). Under this conception, literacy is imposed rather than developed and can be viewed as an entity in itself that will "*have effects on other social and cognitive practices*" (Heath and Street, 2008:103). To illustrate this, the attainment target required to achieve the expectation in writing at the age of seven years (Level 2 at the end of Key Stage 1/Year 2) requires:

> *"Pupils' writing communicates meaning in both narrative and non-narrative forms, using appropriate and interesting vocabulary, and showing some awareness of the reader. Ideas are developed in a sequence of sentences, sometimes demarcated by capital letters and full stops. Simple, monosyllabic words are usually spelt correctly, and where there are inaccuracies the alternative is phonetically plausible. In handwriting, letters are accurately formed and consistent in size" (DfE, 2011d)*

The previous Literacy Strategy of the National Curriculum, followed by most schools in England, until 2009 conformed to this traditional notion which some suggest (Millard, 2005) was restrictive both in normalizing learning and for the pedagogical practice that it imposed. More recent documents illustrate similar indications of prescription (DCSF, 2010, DfE 2011b).

In contrast, a view of literacy that is "*ideological"* (Street, 1984) and based upon a model that is socially constructed and "*socio-culturally sensitive*" (Grenfell, 2012) centres upon ways of looking at and interpreting literacy through cultural and social interaction. It offers opportunity for both collaboration and recognition of the knowledge that a student brings to the learning process (Larson and Marsh, 2005). The origin of this approach has its roots firmly embedded within the writings of the New Literacy Studies and represents "*new ways of looking at and interpreting literacy" (*McLean et al., 2009). These ideas shift the notion of literacy beyond that of an acquisition of skills and sub-skills towards that of "*practice"* which occurs through cultural and social interaction (Street, 1993a).

This term practice, grounded in social-cultural theory, shifts the focus of literacy learning and teaching from a passive activity to one of participation and *"active appropriation of valued cultural practices and knowledge within a social context"* (Gregory et al., 2004:9). As such, learners become involved in their own learning and teachers, instead of acting as the imparters of knowledge use the notion of facilitation through the creation of shared spaces, physically and metaphorically, in which learning can take place (Pahl and Rowsell, 2005). Therefore the terms "*literacy practices"* (Street, 1984) and "*literacy events"* (Heath, 1983) are important terms

required for understanding and conceptualising literacy located within this model of social and cultural construction. Here, the term "*literacy practices"* conceptualises both reading and writing (Heath and Street, 2008) and *"literacy event"* represents *"any occasion in which a piece of writing is integral to the nature of the participants' interactions and their interpretative processes"* (Heath, 1983:93).

Literacy, therefore, can be considered far beyond the acquisition of a set of defined skills if a broader understanding of the concept is adopted which takes into account the social and cultural setting of the context (Street, 1993b; UNESCO, no date). These concepts, and their associated terminology, run throughout my thesis as I try to explore and combine an understanding of the literacy environments encountered, together with the practical application and use of technology discovered, in an attempt to analyse and make sense of the context in which students have used, or attempted to use these to support their written activity. However, for this I also need to take into consideration two other concepts, those of Multimodality and Multiliteracies.

The use of digital technology in this study, with its potential to illustrate different modes of representation, cannot be explored without considering the concept of Multimodality with its focus upon new ways to look at and understand text and textual practice (Kress, 2003). Computers, by the very modalities they are able to emulate, demonstrate multimodal representation (Jewitt, 2006), but paper-based texts, such as the pictures in a child's storybook also provide a useful illustrative example. The incorporation of Multimodality into an understanding of literacy practice, focuses upon a shift away from a narrow emphasis upon speech and text as the only "c*entral, salient modes of representation"* (Pahl and Rowsell, 2005: vii). It gives recognition towards the role of other modes such as image, gesture and other kinaesthetic elements within communication and influences understanding of ways in which meaning is created (Kress, 1994). As such, Kress differentiates between writing and literacy by defining writing as characterised by a writing system; a means of making marks which represent meaning (Kress, 2003a:62) and writing with letters as literacy (a means of transcribing sounds of speech). These theoretical concepts have particular significance, as the reader will discover, not only in the way that users produced text (or were expected to) but also in the modes of communication that facilitated understanding.

In some of the interviews undertaken in the course of this research, and in particular those where speech was either difficult to produce or comprehend, use was made of digital communication devices. However, the affordance of both gesture and facial expression was equally important, so other essential terms included *"transformation"* which has already been indicated for the affordance that digital technologies offer for the shift *between* modes and the significance of types of text production illustrated in this study (see :19). The concept of "*transduction"* (Kress, 2003a; Kress 2003b) is also essential because it describes the ability to *cross* or *access* other modes and could be ascribed to the use of text prediction with younger

children in their early attempts to create and compose text. However, it also held particular significance for some of the older students in this study who had difficulty composing logographic text in situations where the expectation of written text was demanded and have used specific technologies to bridge this divide. The significance of this is highlighted in my final chapter.

Multiliteracies (Cope and Kalantzis, 2000) was also an essential concept to consider as it gave recognition to the many types of literacy that exist across society amidst the rapidly changing notions of literacy caused by the dynamics of evolving technologies. Its application is illustrated in a study by O'Brien (2001) where an attempt to refocus or "*reposition"* the literacy competencies of a group of adolescents "*challenged with literacy tasks in school*" (ibid:1) was described through their work with constructing multimedia projects. The *"under achieving"* students had been framed as such within a traditional notion of autonomous literacy. In contrast, under the wider conceptualization of literacy using New Literacies and predominantly those associated with media, they could be viewed as both "*capable and literate"* (ibid), illustrated and exemplified by the quality of the multimedia presentations they produced. Vincent (2006) noted similar findings with a group of younger children, 9-10 year olds, where multiliteracy practices were actively encouraged within the classroom. There, the multimodal work of one of the students originally described as "*struggling to achieve any success at all*" within the "*terms of the conventional literacy assessment scheme"* was attributed with portraying "*originality and creativity"* as a "*highly skilled communicator, but not through words on their own"* (:55).

Finally, in consideration of literacy practices, Kress' attention to the fact that not only does schooled literacy practice (Street and Street, 1993) foreground the use of language and written language, but does so increasingly as the student gets older (Kress, 1997:39) is an important consideration. The fact that this may not necessarily be the only mode in which meaning can be represented (ibid), the most appropriate form for the task, or necessarily the student's preferred method of composition for expressing meaning (West, 1997) is exemplified in the different modes chosen by younger children developing their writing illustrated in the previous chapter. Then, texts were never produced with written words alone but always incorporated, and often begun, with image or sound. This has particular relevance for examining the difficulties faced by those who need to present meaning though different modes and the acceptance of these practices within educational contexts which, again, will emerge in later chapters.

4.2 Difficulties with Literacy

Despite this cultural emphasis upon literacy, it remains an issue or a difficulty for some. Concern has been expressed that not only do one in six people in the UK struggle with fundamental literacy skills at any one period during their lives (Jama and Dugdale, 2012), but that many

students still leave school with such low reading and writing abilities, that it has direct implications upon any future employability and impacts upon their family and social life (Clark, 2011; Clark and Dugdale, 2008; Gross, 2006). Thus a struggle with literacy not only has a financial implication but also an emotional one, affecting confidence and perception of ability (Peer, 2009; Rose, 2009b).

Parental expectation may assume that learning to read and write is the responsibility of the school (Meek, 1994), but the foundation for literacy 'success' can be laid by factors experienced well before and beyond any formal literacy program (Augur, 1998; Ott, 2007; Portwood, 2000; Stansfield, 2012; Westwood, 2001). Individuals, who struggle with the process, do so for many different reasons. Sometimes this can be the result of poor or inappropriate teaching (Pollock and Waller, 1998) or with specific difficulties, such as those termed dyslexia, which the literacy program they have commonly encountered has failed to address (Ott, 2007). Failure to achieve expectations of literacy attainment at specific stages, in contexts which perpetuate an autonomous concept of literacy, invoke the terms of learning difficulties and special educational needs*;* terminology already discussed*.*

However, as suggested earlier, these terms are problematic since they adhere to a medical model of personal deficit with the implication that the problem rests entirely with the individual (Abbott, 2007). Doing so, fails to take into consideration other potential underlying social and contextual issues such as those Larson and Marsh (2005) argue as the "*normalization"* of the curriculum by methods which, as described earlier, regard and teach reading and writing as discrete skills in a linear and developmental fashion. This leads to the perception of personal deficiency since "*children who do not acquire these skills, knowledge and understanding at the same rate as their peers are soon identified as inadequate in some way"* (ibid :5).

Yet, the complexities and multiplicity of what constitutes literacy is not something that can be developed incrementally for all students (Meek, 1994). Attempts to address such difficulties have resulted in the introduction of specific programs such as the 'remedial' type programs of the 1970s and 80s (Bryant and Bradley, 1995) to remediate difficulties possessed as a result of a narrow, linear, autonomous view of literacy acquisition. Yet, even though the term remedial is no longer widely used in the UK, the inference upon personal failure or deficit, rather than a lack of contextual consideration, remains and is evident in the implications of more recent popular intervention programs that have emerged and represented in their titles; 'Reading Recovery', 'Catch Up' and 'No to Failure', but as Meek poignantly highlights, there is no *"failure in childhood before school"* (1994 :128).

One consideration that I need to explicitly include here, since it emerges within the contexts of my research, is the recognition that is now given to specific types of difficulty with literacy such as dyslexia and dyspraxia. I have given further consideration to dyspraxia later (Chapter 5)

where an understanding is significant at that point, but both are complex. Individuals display a range of difficulties and strengths that may present as a range of disparity and discrepancy (Ott, 1997, Thomson, 1997b) and may be best described along a continuum of specific need. The term itself is derived from the Greek 'dys' meaning difficulty and 'lexis' meaning language. Hence a literal translation relates to a difficulty with words (ibid) but it is more complex as the following definition outlines:

> *"Dyslexia is a specific learning difficulty that mainly affects the development of literacy and language related skills. It is likely to be present at birth and to be life-long in its effects. It is characterized by difficulties with phonological processing, rapid naming, working memory, processing speed, and the automatic development of skills that may not match up to an individual's other cognitive abilities. It tends to be resistant to conventional teaching methods, but its effect can be mitigated by appropriately specific intervention, including the application of information technology and supportive counseling". (BDA, 2009)*

Dyslexia has been the topic of much debate and extensive research, particularly in the fields of both psychology and neuroscience and importantly, because this is not the case in all countries (Australia as one example), it is recognised within legislation as a specific learning difficulty under the Equality Act of 2010. A diagnosis and medical label of dyslexia may offer an understanding that provides comfort and understanding for those seeking to understand their difficulties (McNaught and Mill, undated), although for others it may remain elusive or unrecognized. It is sometimes referred to as the "*hidden disability*" (BDA website, undated). It has also been signified by some as a social construct that has been brought into the public domain because of the emphasis placed upon the understanding and construction of the written word in today's society (West, 1997):

> *"It's not that dyslexia didn't exist before, just that in the days when very few of the population could read phonological coding and decoding issues were rarely a matter of interest. And anyhow, the gifts of dyslexia in professions like blacksmiths, carpenters, farmers and textile workers often outweighed any disadvantages."* (McNaught and Mill, undated)

The provision of digital technologies to support dyslexic difficulty varies (Edyburn, 2003; Gorton et al., 2007,) but with a formal assessment of dyslexia, students entering Higher Education can access the Disabled Students' Allowance (DSA) (Gov.UK, 2012). Some younger students gain support through initiatives such as the Dyslexia Friendly School initiative (BDA, undated); whereby promoting good practice for dyslexic issues encourages an environment that is not only inclusive, but beneficial for all students' learning. However, the problems and issues that are

emphasized in other less inclusive environments are considered to be a lack of consideration of both policy and practice (McNaught and Mill, undated). The failure of schools to accommodate the needs of those who find difficulty with the mode of alphabetic text does not just affect the individual, it may also, as West (1997) points out be costly to society if the "*conventional educational system may eliminate many of those who have the greatest high level talents, especially when these talents are visual rather than verbal*" (ibid:11). I will return to this consideration in my final interpretation.

4.3 Literacy and Habitus

> *"Schooling is the institutional practice of inducting the young in to the literate practices of society" (Olson, 2006:179)*

Before I turn to focus upon writing difficulties explicitly, I want to emphasise that individual difficulty still needs to be viewed through a consideration of both the concept and context of Literacy in terms of environment, people and practice. Learning to write may be both linguistically and cognitively complex (Bruning and Horn, 2000) but Olson (ibid) expresses literacy in terms of social expectation. Learning to write is one part of this expectation. Therefore, the use of Bourdieu's social theory terminology and particularly that of '*habitus*' and '*capital*' have particular significance. This is not merely for the literacy practice or event itself, but how alternative modes of production for the conveyance of meaning may be perceived.

Habitus is the *"conditionings, associated with a particular class of conditions of existence"* (Bourdieu, 1990:53) which shape behaviour, disposition and acceptance of belief. As a social construction, it also defines and perpetuates practice not necessarily from any deliberate intent, but by continued habit (ibid). It may even exist at an *"unconscious level, as a product of history that impacts practice*" that has become "*an internalized second nature*" (Rowsell, 2012:117). Thus the literate behaviours and expectations that an individual has experienced themselves may consciously, or unconsciously, exert influence on their present practice:

> *"If you have strong feelings about what you want your children to be able to do when they become literate, these may have their origins in what happened to you at that stage" (Meek, 1994 :70).*

An individual's own schooled experience, therefore, may not only affect perceptions of what literacy should be but how it becomes *"embedded in convention"* (ibid:124) and practised as *"a set of practices, forms of knowledge which form deep-seated dispositions in the person who is literate"* (Kress, 1997:150). Thus, the literacy activities that occur in schools may mirror and perpetuate those that teachers themselves have experienced. This includes the emphasis upon meaning conveyed through alphabetic text and language alone. Beliefs, therefore, may be situated in both

historical and social constructions that perpetuate specific practices (habitus). The request to incorporate new ones, such as the use of digital technology for an activity that has always been structured, conducted and assessed in a specific way may conflict with a collective (school) or individual's (teacher) notion of literacy and practices associated with it.

Therefore, in contexts where handwritten practices dominate such as in schools, which assumes that the process of writing has to be constructed with a pencil or pen, those who have difficulty or lack the skills to perform these skills efficiently are immediately disadvantaged. The lack of research into writing (Myhill, 2010) and particularly the stage of translation/production, together with the lack of research into the use of technologies and its construction (including efficiency and fluency of the mode utilised), make this difficult to assess.

So does the act of writing require handwriting? Is this perpetuating the significance or the *capital* (Bourdieu, 1990) given to the pencil or pen above any other tool, including digital technologies? These were assumptions and considerations this research evoked. Therefore one of the considerations contributing to writing difficulty that emerged was this focus upon precedence given to specific tools and any reaction to the adoption of alternatives. Despite the fact that different types of literacy have been discussed, the traditional notion of literacy using monomodal, logographic text is retained. A schooled notion of literacy impacts upon the understanding of, and the status given to writing which, as just one aspect of literacy, is perpetuated by the way that those who teach have learned by the measures of an autonomous model. Monomodal alphabetic texts may perpetuate in a schooled context but does this represent the world outside of its walls and other concepts of literacy? The next section begins by looking at writing as I move towards this consideration.

4.4 Writing

So as I turn to writing itself, it is important to distinguish from the outset of this section the contrast between the simplicity and confusions of the term 'writing' and the complexities that its execution involves. Earlier (see :18), I drew upon Flower and Hayes' original model of writing with Hayes' later revisions and used this to isolate the constructive and productive components, in order to differentiate and focus specifically upon the actual production difficulties that students in this study experienced. There were different aspects that the expectation of writing invoked, but the two I have focused upon particularly were the expectation of it as an acquired skill at a specific age and personal autonomy in its execution. Both required a consideration of mastery with specific tools for its production.

Earlier I highlighted the autonomous conceptualization of literacy that exists in schooled environments and how this impacts upon expectation and practice. However, the emphasis given

to perceptions of literacy competence also needs to include the availability and suitability of tools, since these may affect actual physical ability to perform the activity independently. This separates the cognitive elements of the manipulation of language, including the generation of ideas and planning, from those required for the actual execution of the task; that is the recognition of meaning, as separate from the processing for the physical production of the task. Each are separate components of the production (translation) process but need to be activated collaboratively. Both involve cognitive processes but the physical production also involves motor planning and visual-perceptual movement if writing is performed through handwritten production with a pen or pencil. The affordance of digital technologies and their use of components such as a keyboard or speech recognition technology to produce text, necessitate even further consideration regarding the demands required. All of these required examination and analysis.

4.5 Writing: Competences and Difficulties

Both the understanding of text (reading) and its production (writing) is an expectation of our society and its instruction begins early in the English education system. Children start their formal schooling in the academic year in which they turn five which is in stark contrast to countries such as Sweden, where any formal teaching of literacy does not occur until the child is seven (INCA, 2012; TES, 2012). In the UK, not only is there an expectation of formalized learning, but assessment has become common practice (Abbott, 2007). This is exemplified by the use of nationwide standard attainment tests (SATs) from the age of seven and more recently by the introduction of a 'phonics check' for five to six year olds which has not only sparked controversy from some quarters over its narrow emphasis, but also the introduction of formalized testing at a young age (Harrison, 2012).

Present day expectations of the literacy curriculum, as described earlier (see :49), demands writing which, by the age of seven (Key Stage 1 in English Primary Curriculum), includes attention to composition, planning and drafting, punctuation, spelling, handwriting, presentation as well as language structure and "*standard English*" (DfE, 2011b). Yet the complexities of writing require significant cognitive and physical demands (Myhill and Fisher, 2010). There is the processing ability required to produce text, which has to be both linear in structure and meaning (Ott, 1997). The conventions of syntax, grammar and the ability to make revisions are also demanded (Reilly, 1997). The production of mapping speech sounds onto a symbol representation (Kress, 1994) requires planning and sequencing, visual and motor co-ordination in order to form the alphabetic script (Portwood, 1999) that is the mode for the transformation of the thought process into this visible format for others to recognize. Good writers are also able to use both style and voice effectively in their expression (Edyburn, 2003). Importantly, writing requires sufficient motivation, attention span and persistence to pursue each of these. Given the complexity of the writing task and its prerequisites of coordinated cognitive and physical ability

(Myhill and Fisher, 2010), these are significant demands to be met by a child within two years of formal schooling. So writing is demanding but, importantly, it does not occur at the same rate for all children (Bruning and Horn, 2000). Yet, in early years' classrooms, it is sometimes perceived as though it were merely a natural extension of speech (Bourke and Adams, 2010). In contrast, its processes require significant demands of working memory, cognitive and physical skill but also the structure of the sentence (Kress, 1994, 2003a), which, unlike the immediacy and transparency of speech, induces permanency in its production.

Significantly for this research, most written construction undertaken in the early years of school focuses and prioritizes the presentation of handwritten scripts which also demand the "*perceptual-motoric skill"* (Myhill, 2010). The Primary Curriculum outlines the demands for handwriting as the ability to:

> *a. how to hold a pencil/pen*
> *b. to write from left to right and top to bottom of a page*
> *c. to start and finish letters correctly*
> *d. to form letters of regular size and shape*
> *e. to put regular spaces between letters and words*
> *f. how to form lower- and upper-case letters*
> *g. how to join letters*
>
> *Presentation*
> *h. the importance of clear and neat presentation in order to communicate their meaning effectively (DfE, 2011d)*

Yet, there is nothing within these guidelines that suggest either fluency, automaticity or efficiency which may contribute to the composition of higher order processing that allows the working memory freedom to deal with the other complex processes of the writing act (Medwell and Wray, 2008). Myhill suggests that being a "*fluent handwriter*" with accurate letter formation formed with a pencil is regarded as a prerequisite skill for writing (2010:4). So the construction of written text (planning) and its production with physical skill (as one part of production) are both complex activities that use different cognitive processes that have to be brought together to work simultaneously. Yet the National Curriculum embraces these under one simplistic concept of writing.

So I have turned my attention to a consideration of the types of difficulties that individuals specifically experience with the writing process. Those that have examined difficulties with handwriting and letter formation from a physiological perspective, (Ott, 1997: Portwood 1999) appear in Chapter 5. However, the actual composition of text, from the perspective of those who struggle with it, remained elusive and reflected that of research into writing more generally which has received much less attention than that given to reading (Myhill, 2010).

Westwood (2003) summarised that many students who experience difficulty with written expression fall into two distinct groups; those with a learning difficulty and

> *"Those students of any age who can write but don't like to do so – the reluctant and unmotivated writers." (:158)*

He warned that those from this latter group were the ones most likely to develop writing apprehension. Both types of difficulty need effective strategies not only to improve writing but to deflect the cycle of failure and avoidance that comes with it. Graves (1994) suggested that any reluctance stems from the knowledge that most writing in schools is based upon knowing that it will be used to assess what individuals know rather than nurturing writing development. He also drew attention to how little time is actually given in the school day for the opportunity to encourage and develop it.

Graham and Harris (2000) proposed that poor writers were generally those who were poor at self-regulation, with the most common characteristics for difficulties including legibility, spelling, planning and organization but also their lack of content. They suggested that it may be that the physical and cognitive demands placed upon the struggling student, such as those of handwriting and spelling, were far greater for these students than those of more accomplished writers who had automated their responses to these specific aspects of the writing process. For those that experience difficulty, these may interfere with other higher order cognitive processes being used for planning and content (Graham, 1999).

A reluctance to use words that cannot be spelt may also affect any desire to commit words to paper (Raymond, 1997) as well as limiting vocabulary as the individual plays 'safe' in order to reduce the chance of spelling error (Glynn et al., 2006). These issues result in writing that either reduces any content in length, lacks development or is hard to follow (McKeown, 1992). Spelling difficulties are also an issue for many individuals and not just those with dyslexic issues (Ott, 1997) and this cannot be left without attention to Pollock and Waller's pessimistic suggestion that: "*Poor spelling is usually a lifetime's embarrassment*"(1994:49).

5. Using Digital Technologies: Context

> *"Computers complicate the teaching of literacy" (Selfe and Hilligross, 1994)*

Therefore, before moving on to talk about using digital technologies to support students experiencing difficulty with writing specifically, I want to briefly consider this amidst the context of any inherent assumption that the use of any digital technology is both positive and enabling

(Harrison et al., 2004), spending upon the provision of technology in UK schools (Selwyn, 2011a) and its relationship to literacy generally in educational practice.

Some literature has implied that the use of technologies has been seen as a positive contribution to learning (BECTA, 2003a, BECTA, 2009b) but many of these reports originated from the former Government backed organization, BECTA, which was, until its closure in 2011, once the UK's voice for the "*effective and innovative use of technology throughout learning"* (BECTA, 2009a). Its publications epitomised good practice with statements such as:

> *"considerable progress in teachers' use of technology-based tools to support effective learning and teaching over the last few years" (BECTA, 2008:14).*

However, critics have argued that its potential has not necessarily lived up to the realities and practicalities of application once the initial enthusiasm and expectation has faded (Selwyn, 2011a) when "*even the most enthusiastic proponents would concede that the realities of digital technology use in education often fails to meet the rhetoric*" (Selwyn, 2011b:32).

Some have argued that there has been little evidence or knowledge base into how digital technologies have specifically improved learning (Cox and Marshall, 2007; Jewitt, 2006) or *"assess the extent to which technology is changing teaching practice, or changing the way learners learn"* (Laurillard, 2012:83). Warschauer (2006) suggested that although other institutions, such as the military, have integrated new media into their instructive practice, schools "*generally have much room for improvement" (:13).* He argued that although the *"sites, tools and societal requirements of literacy have gone through dramatic changes in the last half century"* (ibid), such transformations have not necessarily been reflected in school based learning. Indeed, it has been suggested by others that there is little to show in any rationale for its application or impact on literacy specifically, and even in those situations where it does exist, its influence remains indistinct (Andrews et al., 2004; Torgerson and Zhu, 2004; Low and Beverton, 2004).

There was little published, peer reviewed research into the use of digital technologies for those who find learning difficult, even though there may have been "*a growing body of anecdotal evidence, much of it lively, well written and worth of study*" (Abbott, 2007:7). The same could also be said for the use of technologies to address writing difficulties specifically (Peterson-Karlan, 2011), even though it was considered that word processing offered "*enhanced supportive features, significantly improve writing and spelling skills*" (Singleton, 2009). Another perceived benefit was improved legibility of text, particularly for those students with poor motor skills (Edyburn, 2003; MacArthur, 1999) and the potential to reduce tedium by the affordance of revision of text without recopying (Graham et al., 2001). However, its benefit for the actual construction and quality of composition was less clear (Cox et al., 2004) and was difficult to

assess whether improvements were the result of the technology alone or combined with the benefits of good instruction (MacArthur, 2006). MacArthur also noted that word processing was "*especially helpful for writers with learning disabilities (LD) perhaps because they are in most need of the support it provides for motivation, mechanics, appearance and revision*" (ibid :253). However, Graham et al. (2001) emphasized that the use of technology did not make writing instruction superfluous and that students still needed to be taught how to make best use of the editing and revision tools. Without specific instruction, they would continue to make the same errors.

In a study by Warschauer (2006) teachers perceived that the use of a word processor was beneficial because "*it encourages a better thought process"* (:65) but his observations with laptop use revealed that very little actual drafting actually occurred. Collaborative rewriting and revision, using the student's own thoughts together with feedback from others, however, offered promise. He also noted benefits in the production of text, which became readable, easier to evaluate, and allowed changes to be made. However it was still felt that, in general, teachers still approached writing with computers in the classroom with the same conventions that were used with pen or pencil, despite the fact that they presented opportunities for new affordances (ibid; Millard, 1997). This illustrated an example of new prospects or affordances being mapped onto existing practices of writing and an indication of the perpetuation of habitus. Therefore the use of digital technologies to support students' writing was not clearly defined in terms of the specific affordances it offered, or was it?

I need to step back for a moment and consider these appraisals within a consideration of the types of literacies that these studies or statements reflected, but also the populations upon whom they were based. Which ones considered differentials between the monomodality or multimodality of texts or the type of literacy (or multiliteracies) as an autonomous or ideological concept? It is useful at this point to refer back to Kress' notion that learning to write can be equated to learning a new language (see :28) which resonates with the suggestion that writing might also be described as a technology in itself since it utilizes a symbol system that affords a "*durable representation of language*" (MacArthur, 2006:248). Considering writing (and text production), therefore as a system, contributed towards understanding the complexity of the task that required (for monomodal texts) a range of specific skills and investment of time to allow it to develop (Meek, 1994; Dunsmuir and Clifford, 2003; Myhill, 2010). It led to a consideration of particular affordances that some digital technologies might offer for specific types of difficulties that some individuals experience in terms of writing rather than the generalities of literacy improvement. It required a consideration of multimodality.

5.1 Writing: A Multimodal Consideration

I earlier referred to two studies (see :50) where students exhibited literate behaviours because their literacy practice was not only viewed under an ideological model of literacy (rather than focusing upon their difficulties under an autonomous model), but their literacy incorporated multimodal activity rather than monomodality alone. Another study, which focused upon making use of different representations for meaning, was seen in one that considered the use of online spaces for learning. It also illustrated an example of literacy ability through the examination of seven Australian school students and the social practices in which they engaged through their use of technology (Lankshear, 1997). It demonstrated:

> *"What goes on in classroom learning is often very different from what goes on in the lives and learning of children outside school" (:172)*

Some of these students illustrated competencies and skills far beyond any of the affordances offered through their schooled literacy practices. They designed web pages, ran small businesses and engaged in global communication practices. Their use of digital technology offered the affordance for the construction and manipulation of text in its widest sense and presented them with literacy experiences that were part of their ordinary, everyday lives. These were not skills they had learned, or experiences that had engaged with or had been integrated into, within the learning context of school. Yet this study was not modern, it was over fifteen years old, long before the ease of multimodal representation and production we have now. It represented an example of multimodal participation but also an acceptance of multiliteracies.

This example of the significance of affordances of both context and materiality was not just restricted to school aged students, since even very young children have sometimes experienced considerable literacy and technology experience in their everyday lives before they begin formal schooling (Marsh and Millard, 2000). Students may bring culturally rich capital and resources from outside of schooled notions of literacy into their classrooms, along with technological competency (Vincent, 2006). Again, there is not space to consider these in greater depth here, but it is recognized that out of school experiences with technologies have significance and do impact upon school practice, but they may not necessarily be included within them (Lee and Levins, 2012).

I need to draw upon one further consideration, because it highlights access to affordances from outside school and holds significance for issues discussed further in Chapter 6. The students in Lankshear's study exemplified involvement within "*communities of practice"* (Lave and Wenger, 1991, Wenger, 2006); a theoretical framework for describing learning through shared practice where individuals who have a shared focus explore knowledge and support one another. A

Community of Practice is exemplified by three specific components: the Practice, Domain and Community. It represents more than just a shared interest because the focus is upon shared experience, artefacts and praxis (The Practice), within a field where individuals have a shared participation (the Domain) that includes as part of their social practice, discussions or activities (the Community). In Lankshear's study, the students engaged in their interests through their out of school activities and through online networking sites which provided opportunities for learning through social networking (their Community and Domain). The internet also presented a dynamic mode for constantly evolving medium for their communication and extended their knowledge base (the Practice), amidst the significance that the opportunity and technology were not available in the students' school. This notion of shared practice, and the use of online spaces for learning, is of particular significance as this study will reveal.

In a further consideration of multimodality, the environment provides everyday examples that communication and representation does not merely occur through language alone (Kress, 2003). A shift from linguistic representation to one of semiotics (signs) is apparent on advertising hoardings, television and even the small device in our pockets; since the smartphone affords access to a variety of modes of communication incorporating any number of combinations of sound, moving image, text and sign through the touch of a symbol. In 1994, Kress gave consideration to the writing given prominence by schools by highlighting the fact that not only did very few people continue with the types of writing that were taught in the classroom in their everyday lives but that, if it was practised at all, was reduced to everyday tasks such as the production of lists and letters. At that time, his general assumption was that people rarely engaged with writing in any substantial form beyond educational contexts. Those sentiments were expressed eighteen years ago and many different digital technologies have since emerged.

The emergence of digital text, and access to a greater variety of digital tools to engage in writing, is believed to invite greater participation in the act of writing than ever before. The findings of the Stanford Study of Writing (Lunsford et al., 2009), a five year longitudinal study of the writing of undergraduates through to their first year after college, found that students wrote for their own needs and desires, beyond those of study or work. Out of this sample, 38% reported writing regularly outside of the curriculum and, significantly, this involved the use of email and other forms of electronic writing. Another study, this time by the National Literacy Trust (Clark and Dugdale, 2009), concentrated upon younger students (aged eight to sixteen) and surveyed attitudes to writing as well as their use of technology. They also found that a significant number of students used technology to perform writing tasks such as blog entries, texts and to interact within social networking sites. Both studies suggested that the advent of an online medium had given rise to an increase in writing, not a decline.

Although the quality of the type of writing created in blogs and texts may be subject to debate by some (De Jonge and Kempe, 2010), and beyond the scope of this study, the emphasis, at this

stage, is that some students do choose to write and increasingly use technology to do so. In contrast, the curriculum still places emphasis upon text that is both monomodal and constructed by hand. It is not without irony that despite the rhetoric espousing different types of engagement with digital text throughout schooling (BECTA, 2009b), the final examinations of schooling; the high stake *cultural capital* (Bourdieu, 1990) of a schooled society, rarely use digital representation in any final assessment. So this leads me into a consideration of a study where these technologies did exist which were able to transform monomodal materials into multimodal representations.

5.2 Digital Technologies and Literacy

Earlier I discussed the inaccessibility of curriculum materials for students for whom writing and reading was difficult. I drew attention to the fact that, in some cases, their difficulties arose not through any inability to understand curriculum content, but the inaccessibility of its materials. This led to the consideration of resources that provided compensatory access, including those utilising Universal Design (see :45).

One example of addressing this type of dilemma was exemplified by the Accessible Resources Pilot Project (DfE, 2011) that provided forty students, aged 11-14 years from nine schools in the UK, with their own laptops and software. All students had a visual or print disability (such as dyslexia), which made reading and writing difficult. Curriculum materials, including textbooks and other necessary texts, were converted into accessible formats for the students themselves to choose how to access on a laptop. Text to speech software was provided which gave the affordance for text to be read (heard) electronically, allowing students independent access to their own curriculum materials in a manner that best suited them. Importantly, the students were able to use their laptops at home and school. The project noted an increase in student confidence and an ability to access and engage with the curriculum independently, in ways that they had been unable to do before. Even though the project was ostensibly about accessing reading materials, it also impacted upon writing and offered insights into students' perceptions and its influence upon their ability and performance:

> *"The project confirms that making teaching materials available to print and visually impaired pupils in an appropriate electronic form along with access technologies to read them can make a significant difference to their reading, writing, confidence, development and inclusion" (ibid).*

The study, however, was only a pilot since similar resources and tools to create such materials were not a common provision in schools. This was exemplified in another recent small scale study of forty primary and secondary schools (Draffan and Litten, in publication) where little evidence was found of awareness, the availability or use (since availability did not necessarily

mean utilisation) of compensatory technology or provision of texts in accessible formats for students with literacy needs. In this study, only 22.5% of the schools had access to any type of text to speech software, 17.5% predictive text, 10% speech recognition software and only 12.5% possessed the availability of tools to convert printed documents into a format that could be read through text to speech. This paucity in technology support for accessibility, however, was not representative of a lack of concern for the provision of a nurturing and supportive environment for students with literacy difficulties, but the material provision of technology and, significantly, the lack of knowledge regarding existence or application:

> *"In all my visits I meet dedicated, enthusiastic SENCOs who want to find ways to improve their support for their pupils but the repeated discovery that quite a bit of what I am talking about is new to schools can get a bit depressing.*" (Litten, personal email, 2012).

In stark contrast, individual assistance with purchase and provision of software and hardware was obtainable for some students if they reached University (Higher Education sector). Then, the Disabled Students' Allowance (DSA) provided any university student with a "*disability, ongoing health condition, mental-health condition or specific learning difficulty like dyslexia"* (Gov. UK., 2012) with support towards their disability related costs which could include hardware, software and other resources deemed necessary to support the student in their studies. These were quite separate from access to any other funding support and did not have to be paid back as part of any university grant funding. A significant number of those who received this funding had dyslexia identified as a disability; numbers which have progressively risen since the scheme's initial implementation (Draffan et al., 2007).

This availability of funding for individuals who reach university, contrasts significantly with that available for specific technologies in any other sector of education. "The Assistive Technology Provision for Education in England Report" commissioned by Becta to consider the provision of assistive technology across sectors in England saw any processes as "*both complex and uncoordinated*" (Gorton et al., 2007). It criticised both the co-ordination and delivery of 'assistive technology', identifying it as "*variable, and generally poor*" across sectors. However, it was particularly critical of specific areas: identifying "*ignorance of funding opportunities*" at preschool level, "*ambiguous*" awareness at Further Education level and *"unreliable"* and sometimes "*inappropriate*" support in Higher Education.

> *"The situation has been getting worse over the years. Small "sticking plaster" initiatives have targeted certain problems while other problems have escalated." (ibid)*

The report set out a range of recommendations to address the "*failings of the current system*" in terms of professional guidance, training and development, a review of funding and ring fencing of

budgets to address a climate of deterioration in service and provision, but also in declining numbers of practitioners. The report was commissioned, but significantly, never published.

6. Text Prediction

> *"One of the challenges and fascinations of studying educational technology is the constant change in the nature of the subject caused by rapid advancement in hardware and software applications." (Charles A. MacArthur, 2009:93)*

My final focus within this Literature Review is to consider the research concerning text prediction, but it also serves the purpose of explaining the difficulties I encountered in doing so. I remind the reader that one of the original aims of my research had been to concentrate upon its utilisation for supporting writing activities, but even within the literature, this proved difficult to do. It became increasingly apparent that it was impossible to isolate the use of text prediction software from the presence of other aspects of digital technology use, as well as issues concerning specific needs or the demands of the literacy activity itself. So, although text prediction was perceived as having potential for the provision of support for students experiencing difficulties with writing by some (Carlberger et al., 1997; Crivelli, 2008; Laine and Bristow, 1999; MacArthur, 2009; Quenneville, 2001), research into its use specifically for this purpose was not only found to be limited (Laine, 2000a; MacArthur, 1998, 2009, Peterson-Karlan, 2011) but complicated by the differing focus and the disparity of age and needs of differing cohorts which produced mixed results. In addition, the type of software used and the way it functioned, the evolving development of software generally and the applications with which it was used, clouded the picture even further. Therefore the intricacies of all possible variables or permutations of software design, the learning or physical issues experienced by the target user and the use of prediction with other technologies, including the word processor, access to speech to text, the hardware upon which it was used and the competency of the user, not only of software but keyboard entry by the operator, made any sort of comparison challenging, if not meaningless:

> *"Research into the effectiveness of this particular type of support strategy has produced mixed results and it would appear that the variables are insurmountable not just because of the type of research but as the result of changing software design elements." ((Draffan, 2006)*

Added to this complexity and confusion were the numerous variables that text prediction software included: the inconsistencies of lexicons, the variability of options, its use with or as

part of another application, as well as the individual's own preferences or learning style (ibid). Therefore, for the purposes of this section of the literature review, I have given a taste of the literature related to the use of text prediction software for the construction and production of written text. However, in the light of my focus within this study and the aforementioned concepts of literacy, learning and consideration of specific need, I would also add that the nature of the literacy task upon which such research has been measured was also significant when the aspect of writing upon which they were based varied from the composition of text to the act of copy typing. The reader should also note that terms such as learning difficulties, disability and word prediction appear because they were used for description within the specified literature.

Text prediction was found in a number of formats but this section does not consider its use for communication with voice synthesis or specifically with other AAC devices, nor the use of systems that required switch use or eye scanning as the mode of entry. These systems required even further technical considerations in an already composite arena. In addition, literature that focused upon the technical potential of algorithms to generate the creation of the corpus used in the programs was also discounted. Already the reader can see the complexities of consideration.

The difficulty in trying to identify and locate literature that specifically related to the use of word or text prediction in this review was highly relevant. The paucity of it within educational journals relating to literacy, learning and technology may have been for the aforementioned difficulties and could have signalled early warnings indicative of awareness and use. However its use as an application crossed disciplines. The initial searches using the terms *word prediction* using databases such as ERIC and JSTOR brought to light only a few of the studies reviewed. Many of those subsequently identified were not found through search engines at all but through a grey search of bibliographies amidst the literature. Articles were then located within journals associated with occupational therapy, speech and language therapy, psychology and rehabilitation engineering. More recent articles brought to light a term "word cueing," a facility that not only suggested words but combined the use of text and speech and added further to the complexity of variables.

As well as being few in number, some of the studies located were small in scale and based upon a single user. This may have been a reflection of the diversity and disparity of learning difficulties, in general, but also the low incidence of specific disability which makes research difficult in this area (Odom et al., 2005). It may also have been an additional reflection of the lack of peer-reviewed research into the use of digital technology for learning difficulties as previously mentioned. Cohorts reviewed in such studies ranged in terms of age across both primary and secondary sectors. Therefore the picture was not only distorted by the range of the variables measured as Draffan (ibid) had indicated, but also by the range of difficulties experienced by the students themselves and the contexts and disciplines in which that research was set. It represented an eclectic mix.

Of particular note was the prevalence of American and Canadian studies. Most of these related to the use of specific products and were at risk of being seen as offering a "*technologically deterministic perspective" (*Abbott, 2007:7) whereby the research aligned itself to a product evaluation, rather than a focus upon application or classroom pedagogy. Such research has also been criticised (Gersten and Edyburn, 2007) for a lack of quality in methodology. Another view might suggest it as one means whereby researchers have tried to contain the multiplicity of variables by identifying a specific type of text prediction with one product. However the passage of time and the constant development of these products have complicated even this consideration. Finally, but of significance, was the scarcity of such literature from the UK even when this included articles that dealt with the broader subject of technology use in the process of difficulties with writing with multi-tooled technologies rather than specifically text prediction alone. This section, therefore has focused upon the application of the technology, either generic or product specific, in order to indicate important themes and relevant insights which I considered useful for inclusion in the light of a lack of specific research. Despite the disparity, an attempt has been made to consider some relevant studies but only included to contribute to the flavour of deliberation in my research rather than representative of any comprehensive review.

As outlined in Chapter One, text prediction software combined with the use of a word processor, (as opposed to that used for texting with the telephone key pad referred to earlier) was developed to reduce the number of keystrokes for individuals with a physical disability (Newell et al., 1992b, MacArthur, 2006), although a diminished number of keystrokes did not necessarily imply any increase in speed of text entry (Carlberger et al., 1997). The application appeared to offer some students new opportunities (McKeown, 1992, MacArthur 1998) for the purpose and improvement of writing composition and actual performance, and continued to be the focus of evaluation both then and in some recent studies (Wollak and Koppenhaver, 2011). Some measures have tended to look at the mechanics of writing such as length of composition, vocabulary use, spelling and sentence structure as well as perceptions of motivation rather than an evaluation of either suitability for writing purpose or the nature of textual composition itself. In an earlier period (1990s) such software was revolutionary but used cumbersome interfaces in comparison to the standards to which users have now become accustomed. One example of this being the fact that the early packages did not offer support for spell checking, although it could be obtained through the use of another program. Yet some of these early studies can still be found in citations suggesting affordance of the application, despite later developments and refinements of functions and capabilities, or the fact that such research was aligned to specific products and the complexity of variables I have previously outlined.

By 1995 some predictive text systems had been developed which incorporated a form of vocal output or speech synthesis from within the technology itself. The availability of a speech mechanism allowed the predicted words to be spoken, but also the writing produced by the user.

This represented a significant development in the technology from single word prediction to the predictive systems that have become more commonplace today and which now incorporate speech into the main writing screen, not just the words in the predictive pane. For students whose reading ability was limited, this offered improved opportunity for support. Therefore with awareness of the variability in software design and focus within this study, the following themes have been drawn from available literature.

Studies on the speed and quantity of text generation have met with equivocal results. Some have shown no evidence for any increase in text generation (Koester and Levine, 1994, Tam, Reid et al., 2002) whilst others recorded an increase in the speed of writing and productivity (Lewis et al., 1998, Peterson-Karlan et al., 2006; Tam et al., 2005; Zordell, 1990). However, it had been argued (Newell et al., 1992b) that measurement of text entry by keystroke alone, the focus of some studies (such as Koester and Levine, 1994), was not indicative of typing speed since one of the primary aims of such software was to reduce the number of keystrokes required for the input of such text (Tumlin and Wolff Heller, 2004).

Impact upon spelling within written texts was another major focus of research and an improvement was noted in a number of studies (Carlberger et al., 1997, MacArthur, 1998 and 1999, Herold et al., 2008) particularly when revisions were measured after use of editing and drafting practices (Peterson-Karlan et al., 2006). This improvement was seen as a positive attribute of software utilisation (Laine, 2000a) but was not necessarily transferred when participants wrote without its support (MacArthur, 1998, 1999). Recommendations suggested that a student still required direct instruction in both spelling and basic writing skills. However, there was a suggestion that the software might have potential for *teaching* spelling strategies and that the collaboration of teachers and developers could create effective strategies and technology which focused upon direct teaching methods. However, to put this into the present context, the software did not have the capabilities of dictionary selection, potential for vocabulary additions and adjustment for common spelling errors that later versions have offered (MacArthur, 2009).

Although MacArthur (1998) stated that word prediction was useful for severe spelling problems, he qualified this statement by recommending that those whose handwritten practices were legible, might be better placed using a spell checker in order to concentrate upon content initially and error subsequently. However, again this statement needs to be taken in the context of the time it was set, because others do not believe that spelling issues are necessarily so easily overcome by merely using standard dictionaries or spellcheckers (Ott, 1997; James and Draffan, 2004, 2012). This is due to the difficulties that poor spellers experience, such as issues with the recognition and use of homophones, or when words are inadvertently used inappropriately (such as where/were) and not subsequently identified.

Motivation and perseverance were earlier referred to as an essential element of writing development, however, in order to develop writing ability and confidence, students require regular opportunities to partake in the activity (Westwood, 2003). Without motivation, a student was more likely to avoid the task and a self-perpetuating cycle of avoidance was likely to occur thus: "*The challenge for the teacher is to motivate such students to write and to provide them with enough support to ensure increased success"* (ibid:152). Laine (2000b) cited students staying on task for longer periods of time using computers in comparison to paper and pencil activity but the use of word prediction has also been attributed to an increase motivation amongst participants (Newell et al., 1992a, MacArthur 1998, Tam et al., 2005). However, motivation was an aspect more recently questioned by MacArthur (2009), not only to discern which students were encouraged to write by the use of word prediction but in what contexts they did so; a question which motivated my own interest focus.

The significance of some of the studies also lay in the field of disciplinary interest in which they were set. Zordell (1990) approached his research from his role as a speech and language pathologist and made observations on spelling, sentence structure and vocabulary use as well as speed of writing and improved motivation for a variety of writing purposes. His research included use of journals and creative writing opportunities. In contrast, Koester and Levine (1994) approached their research in the context of a rehabilitation-engineering program and focused upon speed of communication. Carlberger et al. (1997) represented a shift in the focus of research from the quantitative measure of the efficacy of physical speed to use a combined approach of quantitative and qualitative measures. It included a focus upon more abstract linguistic factors such as intelligibility and general style as well as a focus upon spelling and vocabulary use. This research represented a combined approach from two differing fields, speech pathology and electronic engineering. Whilst Newell et al. (1992a) used an interdisciplinary team from speech therapy, special education and technology to consider the quantity and quality of writing, including spelling. What became significant was the research field, and the influence of it, upon the specific aspects which identified and grounded the researcher's perceptions of literacy and what was perceived as change. I would, therefore, suggest that the field in which any research was set was as significant in any analysis of the studies as their findings, and needed to be included in any consideration of perceptions of efficacy, since this influenced any understanding or generalisation of literacy that the role of text prediction had within it.

A case study into the use of text prediction with a young student struggling with written expression (Williams 2002) indicated that the technology not only provided spelling support but enabled the student to produce longer texts over a shorter period of time. However, it did not significantly recognize any alteration in the structure or quality of writing. This emphasized that software alone does not provide support in itself but that specific instruction (Graham et al., 2001) and feedback were still critical for writing. Other citations of the benefits of word

prediction included its role as a scaffold towards literacy (Gillette and Hoffmann, 1995) and as a support to increase and vary vocabulary use (MacArthur, 1999; Tam et al., 2005; Laine, 2000b).

One of the most recent case studies (Wollak and Koppenhaver, 2011) differed substantially from others in its emphasis upon writing and student experience rather than emphasis upon the technology itself. It combined a focus upon models of writing to provide explicit instruction, the provision of text prediction using the program Clicker as a progression into its utilisation where necessary, and online modes of communication to provide meaningful writing purpose. Students of lower secondary age with a range of specific needs (autism, physical impairment and learning issues) became "e-pals" with inclusion undergraduates studying new technologies. This match enabled the undergraduates to gain direct experience of learning difficulties and supportive technologies with students who, as a result of poor instructional opportunities or their own specific needs, held negative views about literacy. Through a regular exchange of online communication over a two-year period, each of the students with specific needs were encouraged and supported with text construction and development. The study was not intended to be a formal research study but "*a description of the use of theory of writing to guide instructional planning and program development as well as careful technology selection in the support of student writing growth*" (ibid:13). It provided an enriched environment with both motivation and purpose for regular involvement in literacy activities within a scaffold of instructive and technological support.

Finally, the recent study into the availability of accessibility software in schools in England referred to earlier (see :63) found little evidence of text prediction awareness or use. Out of a study of forty schools, twelve claimed possession of the software but only seven reported actually making use of it. This use was confined predominantly to secondary aged students with only one incidence found in any primary school:

> *"three of the six secondary were schools with more specialist provision than normal so they were generally better provided. Like speech recognition, my impression is that most schools are not even aware of its existence, so no surprise they are not offering it." (Litten, email, 2012)*

This small study, therefore, illustrated the lack of utilisation of text prediction software that I was to encounter myself, but specifically drew attention to the paucity of use within primary education.

7. Principal Theoretical Concepts

My critical review of the literature explored and centred upon a set of core theoretical concepts around the strands of literacy, disability and the use of digital technologies that not only

informed the study but also the design of the research structure. This review revealed that key terms were sometimes used interchangeably or with different interpretation in some contexts. The first of these core theoretical concepts was Disability. It was evident that there had been an epistemological shift in meaning from a medical model depicting personal deficit and inability towards a more recent construction encompassing social and cultural considerations. My theoretical analysis of this central concept of Disability incorporated related issues such as access to education, potential employment opportunities and social inclusion but also vulnerability to exclusion, poverty and dependency.

My review of the literature also highlighted the limited research base surrounding any use of Digital Technologies for those with specific needs. Some utilization was classified under a concept of Assistive Technology (which in itself could be considered as limited if Disability is taken as an evolving and fluid concept involving more inclusive approaches). Some use was also located within the concept of Universal Design. Both approaches invoked theoretical deliberation regarding the potential affordance offered by the use of technologies as a physical provision towards support and compensation but also potential opportunity for social and cultural participation and inclusion.

As a sociocultural construction, Literacy could be depicted anywhere along a continuum from an autonomous to an ideological model (Street, 1993a). Any attempt to explore and describe this concept of Literacy theoretically depended on two related concepts of Multiliteracies and Multimodality. Multiliteracies incorporate and recognise the many types of literacy that exist, not only to communicate meaning but also to signify ability, creativity and knowledge, whilst Multimodality shifts any understanding beyond emphasis upon speech and text alone. It recognises and incorporates other modes by which communication and meaning can be constructed (Kress, 1997).

These principal theoretical concepts permit a stronger and theoretically richer way in which to examine and describe phenomena encountered in this research study; including what is being sought (or offered) through digital technology use to increase engagement and participation. Yet, social and cultural influences cannot be ignored either. These are not static concepts. Some have undergone significant evolution contributing to wider understanding and can be more aptly viewed along a continuum. Any attempt at analysis depends upon context; not just the physical environment but also the enactment of ethos, perception, social behaviour and culture. The tools and resources used to create written texts within these contexts are also important. Therefore, a detailed examination of the context is required to determine whether perceived difficulties with writing are a result of personal inability (itself a deficit view to some extent) or a lack of environmental and theoretical consideration.

8. Summary

My literature review used the three strands of focus to provide structure to this chapter. It began by discussing the concept of Learning Difficulties and Disability and highlighted the paradigm shift towards an awareness and acceptance of a social and contextual model of consideration for disability rather than focus upon one of medical or individual deficit. This drew attention to the evolution of other terms, such as Inclusion, and any associated issues. This, in turn, pointed towards existing models of support and provision; such as the increasing use and reliance upon Teaching Assistants to support students with need in mainstream schools.

The use of Digital Technologies as both a compensatory resource and one that supported support learning was discussed along with the potential of mainstream utilities incorporating Universal Design. This considered an evolving concept of Digital Technologies both in terms used, such as Assistive Technologies, when utilization is not contained merely to those with need or brought about by a change in design, but by a shift in awareness. Literacy provided the platform for a discussion of the term as a theoretical concept but also its value as a cultural commodity. This highlighted that although Literacy may be taken for granted, as a social and cultural construction the term varies according to differing paradigms of understanding. Attention was also drawn to the concepts of both Multimodality and Multiliteracies and the emphasis that, in schooled practice, as a child moves through the system increasing emphasis and value is given to language and text. Yet, despite this prominence, a number of individuals still leave school with low reading and writing ability.

The chapter also included a discussion of writing in educational contexts, including the difficulties that some individuals face with its production and highlighted the consideration of digital technology provision as means of support and compensation. This included a brief deliberation of the role of text prediction technology itself and the difficulties associated with interpreting and using the limits of existing research. The chapter concluded with a reflection on the influence of all three strands and the principal theoretical concepts that have helped to both inform and shape the design of my research. I now turn to the way my research was conducted.

Chapter 3: Methodology

1. Introduction

This chapter begins by examining the principal theoretical concepts that guided my research and justification for the approach I have taken. The term '*ethnographic perspective'* is examined and I have described what this entails. I explain why my study was broken into two separate phases: an initial purposive phase designed to identify individuals with knowledge of text prediction, followed by my focus across other types of digital technology use in the second phase. I explain how the final sample of respondents was selected, the methodological tools used and the nature of data examined. This is followed by a description of the Pilot Studies undertaken for both phases and the considerations that each of these prompted. Finally, I have presented the processes involved in analysing my data with examples. The chapter concludes by describing the approach I have then taken in presenting my findings to the reader.

2. Research Approach

My research was a qualitative investigation set within an interpretive paradigm that explored the contexts in which students used digital technologies, including text prediction, to support their difficulties with writing. I have described my research as an "*ethnographic perspective*" rather than as ethnography by adopting Green and Bloome's (1997) term which they describe as: "a *focused approach* (i.e., *do less than a comprehensive ethnography) to study particular aspects of everyday life and cultural practices of a social group"* (:183). My work is not ethnography in any traditional sense, because of its narrower focus and the shorter time frame spent on fieldwork, but it was guided by its theories of culture and practices of inquiry derived from anthropology or sociology (ibid). My use of the term recognises that ethnography, as a concept, has not only evolved over the years but has become increasingly sophisticated and this has enhanced what can now be described as ethnography and what this can encompass (Street, 1993a). However, any attempt to define or use the term depends explicitly upon the context in which it is used because ethnography can be used to describe a "*process of enquiry*" and a way of "*exploring, knowing, and acting in and on the world"* (Green and Bloome, 1997 :181). My research draws upon this contemporary interpretation and description of ethnography and so I have begun by considering the concept of culture itself.

The way people behave, the values they attribute to specific practices and artefacts are associated with the particular cultures or social practices they belong to or participate within at any given time. Geertz' reference to humankind as '*an animal suspended in the webs of significance he has spun"* (1973 :5); uses the web to symbolise the culture that people construct by their own actions and interactions (Gregory et al, 2004). This use of imagery employs a visual metaphor to draw attention to structure, but the composition of a web is also fragile and

transient. This interpretation depicts human behaviour as neither fixed nor predetermined but always context dependent because the social world is not static but constructed, dynamic and evolutionary (Cohen et al., 2007). Context was an essential issue within my research and influenced by cultural and social activity but also historical practice. Acknowledging this understanding lay at the heart of the approach I had chosen to adopt yet, in doing so, I also needed to consider my own assumptions in order to make explicit their potential influence on any subsequent interpretation.

How reality is interpreted is an important factor within social science research but, equally, so is the potential of any influence from personal belief (Guba and Lincoln, 1998; Silverman, 2010). This includes assumptions of an ontological nature that concern the *"very nature or essence of the social phenomena being investigated"* as well as those based upon epistemology regarding the acquisition and communication of knowledge (Cohen et al., 2007:7). Researchers who align themselves to a view of reality which emphasizes the subjective and constructed creation of the social world may favour a qualitative approach, whilst those who view the world as fixed and objective may prefer to turn to those that can be quantitatively measured (ibid). The theoretical concepts underlying any choice of approach, therefore, not only affect the type of data sought but how it is subsequently interpreted. My qualitative approach enabled analysis and interpretation of phenomena by critically unpacking and examining the practices, terminology and constructs encountered. This needed to be set within the context of my own beliefs and any potential influence of personal experience since I had been actively involved in the use of digital technologies with children (both professionally and as a parent) for many years. I had also worked with individuals with specific needs and impairment in differing contexts. These experiences had influenced, both consciously and subconsciously, my thinking (and my practice) and had contributed to my own ontological and epistemological assumptions.

I was influenced by New Literacy Studies and held the view that the concept of Literacy could be viewed as a sociocultural construction with the existence of a range of possible literacies (Multiliteracies) and involved the concept of Multimodality. Therefore, I recognized the diversity of modes by which meaning could be constructed, designed and produced rather than simplistically viewed as encoding and decoding skills. I did not view Literacy as a set of prescriptive skills (Grenfell, 2011). I also considered attitudes towards disability, difficulty and impairment issues within a similarly constructed perspective based upon social and cultural consideration. Again this concept was driven by context and could similarly be depicted along a continuum with my own perspective giving emphasis to the constructions and influences of social and cultural practices rather than those of individual deficit.

My ontological assumptions towards the use of digital technologies were more complex. I had seen (and used for myself) technologies that appeared to benefit learning but I had also witnessed them used with little effect. These experiences made me consider their inclusion

selectively; so I did not set out with a techno-deterministic attitude or with any theory to prove in a positivist fashion. To the contrary, I favoured a qualitative approach because it permitted opportunity to explore issues in an open-ended fashion and to hear the voices and experiences of those involved in the research. I not only wanted to discover whether technologies were used; but also why and how this use had occurred. It was also essential that my exploration included the exploration of Literacy itself or, at the very least, an understanding of the nature of the literacy activity being undertaken when digital technologies were used. I did not want to merely dwell upon the use of technology alone, but the nature of what was described as difficulty with the production of text and needed to find a way to explore the worlds of those who used digital technologies *with* them. As such, my choice was influenced by the need to choose an open-ended methodology. It needed to be interpretative and had to take place, as far as possible, within natural settings, where the focus could be applied to authentic experiences in which individuals led their everyday lives (Denzin and Lincoln, 1998; Guba and Lincoln, 1985). I wanted to explore within a naturalistic paradigm; one that accepted that the world is constructed of multiple realities (Cohen and Manion, 1994). Yet, how I went about this was also influenced by other essential considerations.

2.1 Research involving Children and Young People

One of these considerations concerned my specific focus upon children and young people particularly when one of the criticisms levelled at such research is the lack of regard given to the methodological issues of research involving them (Curtin and Clarke, 2005; Greene and Hogan, 2005). More recently, however, researchers have become increasingly aware of the need to provide greater opportunity to try to present the child's view of the world in which they live, despite the issues, both methodologically and ethically this may involve (Greene and Hill, 2005; Grover, 2004; Lewis, 2010; Nind, 2008; Parsons, 2010; Powell et al., 2011, Stafford et al., 2003; Wickenden, 2010). In this study, including children and young people's voices, rather than merely using them as objects of research, was important because it recognized that when children are included and able to tell their own story, it is often powerful (Grover, 2004). Yet, it presented additional challenges that went far beyond giving adequate time to gain trust or the importance of recognizing that different ages needed to be treated differently (Greene and Hill, 2005).

My introductions to children and young people ultimately involved in this study (aged eight to fifteen) were instigated and mediated by a gatekeeper: a visiting support teacher, but it is recognized that my visits and meetings were, with the exception of one, isolated events. Despite the brevity of such interactions, the benefit of experience working with children and young adults was critical to the way I was able to conduct any observations and conversations (interviews). Besides the practical issues to consider with gaining access, school and relevant adult/parental permissions; children's consent was always seen as an on-going process rather

than merely accepted (Parsons, 2010). The choice to participate had to be theirs, so this involved additional awareness on my behalf by being sensitive to their nuances of behaviour such as any shift in body language or speech and being ready to act or withdraw accordingly. It was also important to acknowledge that my understanding would always be "*partial and imperfect"* (Greene and Hill, 2005):

> *Our experience of the world is constantly unfolding and in flux. It is complex, multilayered and not fully accessible to us let alone to others. For an adult researcher to understand the experience of a child (or children) as a stranger is in many ways an impossible task. (ibid :17)*

Yet, this inclusion was vital. The children added richness to my study. Their actions and comments contributed to its many layers and an essential part of the picture under composition; so accepting that my understanding may only have been partial was recognised and I considered this preferable to not including it at all.

However, there were also issues of potential exploitation and power to be considered. This involved awareness that children may give responses because they want to please, rather than be truthful (Greene and Hill, 2005) or merely because that was how they felt they were expected to react (Grover, 2004). My observations of all but one of the children took place in their respective schools, so it is noted that this may not always have been the best place for views to be aired (Stafford et al., 2003). In complete contrast, the initial visit with Nick, the focus of Chapter 6, took place in his own home; providing the benefit of a known environment and importantly, time for him to be able to communicate in the manner that he both initiated and sustained. I felt that this was an important consideration not only towards the construction and development of this particular encounter, but contributed to Nick's continuing and on-going participation in the study subsequently.

2.2 Disability Issues

Since my research included some participants with an impairment, the theoretical concept of Disability had to be addressed particularly as one of the criticisms levelled at research involving disability issues is the potential to treat individuals as objects of research. Respecting and '*including'* the view of the individual was, therefore, important rather than reliance upon parents and associated professionals (Charlton, 2000; Fried-Oken and Bersani, Jr., 2000; Wickenden, 2010). It involved considering the shift in epistemological paradigms between medical and social views of Disability as described earlier but also as an evolving and fluid concept (see :39). The political and philosophical phrase: '*Nothing About Us Without Us'* illustrated this *"historic break with the traditional perception of disability as a sick, abnormal and pathetic condition"* to one which viewed disability as: *"normal, not inferior, and demands self determination over the resources people with disability need"* (Charlton, 1998:10). This led to recognition that perceived

methodological difficulties and concerns over ethical practices were behind the reasons why children were often excluded from participation in such research (Newell, 1997; Nind, 2008; Wickenden, 2010). Yet these missing voices were the very voices I wanted to hear; so a methodology that responded to ethical concerns, allowed flexibility, could be shaped by participation and was able to capture the complexities of the lives of non-homogenous participants was essential.

2.3 A Sociocultural Approach

My research involved sociocultural theory surrounding the act of learning itself. Researchers interested in culture and development, who have based their inspiration upon the writings and learning theories of Vygotsky, generally agree that: "*individual development constitutes and is constituted by social and cultural-historical activities and practices*" (Rogoff, 2003:51). This emphasizes that it is not culture that influences individuals, but the creation and contribution to culture that people make that, in turn, contributes to the creation of people; in other words, neither are separate nor mutually exclusive, but constitute one another. People learn from participation with successive generations, extending what they have learned and used. Thus learning is a perpetuated and shared act which contributes to the "*transformation of cultural tools, practices and institutions*" (:52). As part of this growth, younger members learn from and with other experienced members of the community but in a way that is active and participatory; not merely as passive recipients of knowledge (Gregory et al., 2004). This concept of sociocultural influence was important because it: "*transcends academic disciplines and focuses on the inextricable link between culture and cognition through engagement in activities, tasks or events*" (ibid :7). The approach was also sensitive; enabling the ability to both view and interpret literacy within specific contexts through cultural and social interaction (Grenfell, 2012) beyond any psychological or cognitive domain, to one that is both synthesized and integrated (Gregory et al., 2004).

These considerations were essential and were reflected in the following extract from my Research Diary:

> *"My early research into literature pertaining to word prediction use illuminated/revealed that many of them had used a quantifiable approach to ascertain a quantifiable measure. These were limited because I felt they did not reveal the whole picture, or at least the context in which the study had been set or carried out. More importantly they were about people who had names, character and differing needs. It wasn't, therefore, the social, cultural or historical nature of enquiry that was lacking but, for me at least, the lack of consideration of the*

enormous differences (individual) that such studies could not describe."
(Research Diary, 8.3.2011)

My interest demanded language. I asked questions, listened to opinion and discussed experience. It began with a focus that explored the potential use of text prediction with younger children and their journey into writing, but when I subsequently discovered there was little evidence to suggest this explicit use, I widened my focus to include exploration with students of any age using digital technologies and experiencing difficulties with writing. I then focused upon this explicit use with key informants. What I discovered was inextricably tied to theoretical concepts of Literacy and Disability, perceptions of difficulty and the influence of context upon use.

I wanted to learn about the contexts in which technologies were used but my interest required an inductive approach rather than any hypothesis or quantified measurement. Undertaking a qualitative approach permitted me to explore the complexity of human behaviour and sociocultural practices underlying any use of digital technologies, not merely technical interest. I did not want to dwell purely upon types of digital technologies used but an approach that was flexible enough to permit questions that explored use. A qualitative approach permitted this examination of the phenomena of people's lives and their behaviours (Silverman, 2010) because it considered elements such as human perception and how context affected and influenced the choices people made. My research, therefore, was set within an interpretative paradigm that sought to "*understand the subjective world of human experience"* (Cohen et al. 2007:21) and a focused means to explore the phenomena of everyday activity in people's lives in depth.

3. An Ethnographic Perspective

My use of an "*ethnographic perspective*" (Green and Bloome, 1997) allowed me to pursue this focus in greater depth with participants by using a naturalistic approach to explore cultural, social and historic understandings. New Literacy Studies informed my approach. It enabled Literacy to be explored in its widest sense within this socio-constructivist framework. Yet, my use of the term 'ethnographic perspective' required close examination. My study examined social practices concerning literacy and digital technology use. It included concepts of social and cultural theory, perspectives attributed to difficulty, difference and disability. Yet, these did not dwell upon medical models of individual incapacity or inability. My research was a story of exploration, but in order to include the experience of others it required a "*conceptual and methodological bridge"* (Androutsopoulos, 2008); one that would traverse the disciplinary areas of my interest yet focus upon, and include, opportunity for both personal narrative and reflection. An 'ethnographic perspective' facilitated this possibility.

Within social sciences ethnography may once have been simplistically described as an in-depth description of data gathered over an extended period of time. These definitions focused upon its

use of language to describe the phenomena, people and culture; uncovered as a result of immersion in observation and interaction with those being studied (Silverman, 2010). Yet my understanding of ethnography was based upon a much deeper theoretical consideration than this. It involved one in which a concept of ethnography could be viewed along a continuum of understanding from one as a process but also as: "*a theoretically driven, situated approach*" in its own right (Green and Bloome, 1997 :183). It involved much more than use of specific methods or tools but represented an evolution of enquiry that attempted to understand the worlds that people were immersed within. This required viewing and considering data from both an emic perspective; the subjective meaning constructed through my informants' version of their lives but also the etic perspective as I stepped away and reflected upon this version objectively in order to reach my own understanding (LeCompte and Preissle, 1993). As such, an ethnographic perspective involved not just technique but an inductive process that required a consideration of ontology; not only of those participating in the enquiry but also my own as a researcher (Blommaert and Jie, 2010).

The use of language was an essential component. The summary and examination of my journey was captured within research journals which represented an "*archive of research*" (Blommaert and Jie, 2010 :10). The descriptive language I used needed to be sufficiently "*thick*" (Geertz, 1973) or "*solid*" (Wolcottt, 1995, 2009) in order to capture and convey the richness of data that emerged. I adopted the ethnographic tools and techniques of observation, interviews and collection of artefacts but my study differed from a traditional or classic ethnography due to the shorter time periods actually spent in the field, the intermittent nature of these episodes and the narrower focus of my enquiry. In contrast traditional ethnography, like those epitomized by Heath (1983) or Street (1984), are more commonly associated with extended periods of observation and a study of much broader depth and dimension in order to understand the complexities of the worlds being studied (Fetterman, 2010). However, it is now recognised that modern works of ethnography can be derived from much briefer visits over an extended period (Wolcott, 1994); the extent and frequency of these dependent upon the circumstances made available to the researcher and the context in which the research is set (Jeffrey and Troman, 2004). My research made use of a "*selective intermittent time mode"* (ibid) so that my visits (a term I have used with care since these involved online interaction not just entry into a physical setting) suited the diverse geographical spread of my informants' locations but also offered flexibility to some, permitting them to choose convenient times and ways in which to engage in dialogue without necessarily having to meet face to face. This also allowed time for reflection between interactions and contributed to enabling both contribution and collaboration.

3.1 Validity

Validity and truth presented the greatest challenge in my approach because the use of ethnography has sometimes been criticised not only for the methods it employs, but the claims it

makes. Hammersley (1990) described the aims of ethnographic investigation as "*using the general in the particular, a world in a grain of sand"* (:601) and questioned how claims taken from an in-depth investigation of the micro-world could possibly draw conclusions on the more general nature of the social world and its social processes. The heterogeneity of the key informants involved in this study categorically precluded generalisations of any nature and particularly the analytic generalisation of one case study to make any specific inference of typicality (Mitchell, 1984). In contrast, my use of an ethnographic perspective provided me with the opportunity to examine experience and illustrate diversity, not generalise.

Wolcott preferred to seek clarity by the considered and careful attention to data in what he termed as "*rigorous subjectivity*" (Wolcott, 1994). However, Hammersley criticised the use of "*insightful descriptions"* when they were then used as "*theoretical descriptions"* (1990 :601). He argued that the content and use of description was misleading because it could never be held as truth when those who conduct enquiry "*are determined by assumptions about what is relevant*" (ibid :607). In my research, description and narrative were used to analyse "*the culturally rich methods through which interviewers and interviewees, in concert, generate plausible accounts of the world"* (Silverman, 2010 :225). However, this may lead to criticism that relying upon what people say, rather than what they do neglects "*the complex relationship between attitudes and behaviour"* (Hammersley, 1990 :597). My inclusion of personal story, therefore, required careful consideration. Although the illustrations I have used arose from interview and discussion, they were not used in isolation. In order to emphasize their diversity, I have compared stories and drawn issues from them into dominant or recurring themes across accounts rather than trying to over-simplify phenomena. I have also used illustrations of digital technology use to provoke thought and illuminate disparity; not as any attempt to proclaim an ultimate truth, but to accept its multiple realities (Fetterman, 2010).

My use of an ethnographic perspective brought understanding to the social and cultural processes that arose from the site (Jeffrey and Troman, 2004). The etic and emic movement that the perspective involved epitomized the process of ethnographic enquiry, with constant analysis an essential component. The flexibility of the approach offered opportunity for issues to be reframed and changes implemented when necessary (Fetterman, 2010). I discovered a landscape that was cluttered and chaotic but instead of trying to reduce the disorder, my use of the perspective helped me find an explanation for it in a way that "*theory becomes the theorisation of the data*"(Blommaert and Jie, 2010:12) or as Heath and Street summarise*: "a theory building enterprise"* (2008:10) in its own right. Adopting an ethnographic perspective in this research entailed adopting an approach based upon epistemology; it was never merely a method. It was messy because "*reality is kaleidoscopic, complex and complicated, often a patchwork of overlapping activities"* with many elements to consider and although these multiple factors were difficult to capture, their complexity needed to be included and described in a rational, logical fashion (Bloemart and Jie, 2010:11).

An ethnographic perspective involved knowledge being examined, reassessed and revisited because this iterative action helped shape the decisions that led to its progression. In order to unravel the wealth of data and its complexity, I turned to the advice of Wolcott (2009) and adopted the three components of description, analysis and interpretation to give some semblance of order to the chaos unleashed. I have used "solid" description to record the data, the analysis to begin to think about and analyse its content and finally, the part I have tried to hold back upon, my interpretation; what my research meant in a much wider context and the sense that could be made of it, although Wolcott warned, and I soon learned, that analysis and interpretation were never mutually exclusive but blurred into one another (Wolcott, 1994).

My research process was therefore dynamic. It offered opportunity to respond with the movement of enquiry, but also legitimised and emboldened my approach. Voices, emails, field notes and my research diary were constantly returned to and re-examined. I immersed and re-immersed myself within data, but also withdrew and looked back upon it from afar. It involved both journey and exploration that started with a map that was ultimately discarded when I learned to trust the approach and allow myself to meander. Description was essential but also continuous reflection because this prompted further exploration. My study evolved through re-examination of themes that were ultimately used to refine the enquiry. I experienced the "*cyclical process"* that Fetterman (2010) had described. It felt like a tightly coiled spring around the world being examined; winding around content, returning to a similar point but having shifted just a little more each time. Sometimes the coils of this spring were pressed tightly together, yet at other times stretched slightly apart, but this movement offered flexibility and growth. It was this process that guided my progression through my research, but it involved constant contemplation throughout its evolution.

Constant critical awareness was required upon two levels. As my focus was instigated from personal interest, I needed to recognise that "*the biases of our careers, our personalities, our situations constitute essential starting places for our research attention*" and although good bias may guide research, the opposite may "*reflect prejudice"* (Wolcott, 1994:408). Additionally I recognised that research is never merely a "*technical activity"* but always affected by personal expectation and supposition (Silverman, 2010:101). I had to constantly consider my own presence and acknowledge that it was impossible to be entirely neutral either in my approach or how I was perceived by those involved; my own theoretical reflexivity (Foley, 2002). I was introduced or previously known to most informants as a professional working in the area of technology to support students with difficulties. This was reflected in the nuances of conversations that entailed specific terminology and involved a sense of shared understanding. However, my status was always constructed and negotiated within each and every encounter. I constantly needed to differentiate between what I observed and what I inferred (Wolcott, 2009) as well as think about what was subjective (Bloemmart and Jie, 2010). Therefore, as I moved

between emic and etic perspectives, I had to consider not only how I recorded my observations but also how I analysed my understandings (Fetterman, 2010). The emic perspective of the insider was evident through conversation (interviews) conducted with informants amidst the stories they revealed reflecting their own contexts and cultures. Yet this entailed recognition of multiple realities (see :79), so I had to step back from these personal stories and look at them beyond their immediacy in order to try to position any analysis objectively. My own position also held emic and etic qualities because I entered sites as an invited visitor but was also an outsider to the everyday lives of those I met (Heath, 1983); someone whose understanding or appreciation of the realities of my informants' daily lives was held to question.

3.2 Ethics

Ethical approval for my research was given by Kings College, London [REP (EM)/09/10-2 and REP (EM)/09/10-18]. After initial contact with individuals (in which a verbal or written outline of the study was given), all adult participants were then given a letter with consent forms that required signature prior to participation (Appendix C, D and E). For those who could not sign by hand, or who participated by email, informed consent was signified with the returned form attached to an email. Letters of consent for school aged students' participation were also exchanged with their parents (Appendix F and G), the Head Teacher of their respective school for observational visits (Appendix H) and the students themselves (Appendix I). All names of individuals and places have been changed and pseudonyms used to protect personal identity.

These were the practical aspects of research but since ethics also involves responsibility, both personally and socially (Wolcott, 2001), much of my research focused upon individuals who worked within a relatively small community at a time when significant fiscal cuts were being made to budgets and services as a result of redistribution and reallocation of resources both at Government and local level. Despite reassurances of the use of pseudonyms, there were occasions when some comments were made that I felt, if recognized, might jeopardize an individual's role or, at the very least, a relationship with colleagues and I have, on occasions, been circumspect with specific details in such descriptions.

Finally, since my research involved engagement with a heterogeneous population and involved discussions of disability issues and awareness of basic rights; a social responsibility in illuminating and describing such issues sensitively and respectfully, yet transparently, to those without such knowledge was required. It was, therefore, important to ensure that those assisting my research were aware of the duality of their role; they were not only helping to inform my research but were actively participating within it.

4. Research Processes: Creating a Research Framework

I began by creating a framework to guide my research process. This was initially influenced by Squire and McDougall's "Perspective Interactions Paradigm" (1994); a model suggesting that the learning process invoked by educational software use was driven by the dynamics and interactions between three principal actors: the designer, teacher and student (Figure 8).

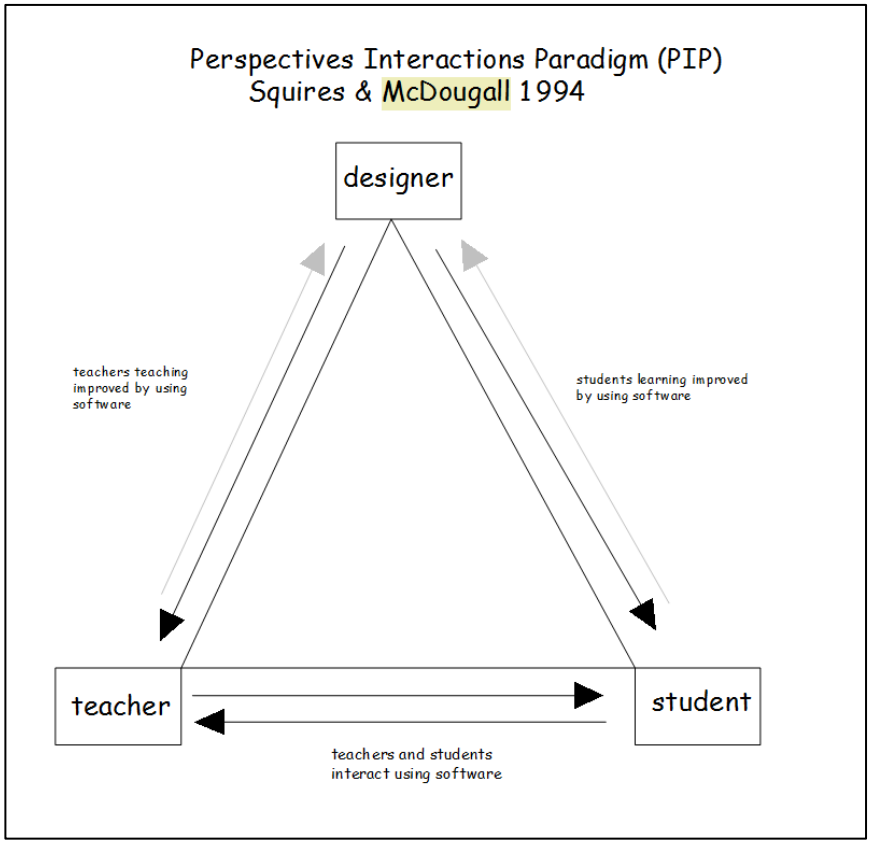


Figure 8: Perspectives Interactions Paradigm (Squires and McDougall, 1994)

I began by considering the key actors involved in the use of digital technologies to support writing. Instead of a designer, I combined the views of *Developer and Distributor* in order to review insights into broader contexts of use rather than merely that of one developer's specific product. I changed the scope of teacher to *Facilitator* in recognition of others who might influence an individual's use of technology, including the provision of physical support (Salminen, 2008). Similarly, I felt that describing the third key actor of student was restrictive and merely extended this to *User* to encompass anyone using the technology.

I also wanted to be able to focus upon, but also compare, elements within the three strands of focus: Literacy, Digital Technologies and Disability and Learning Difficulties. These were then layered to present a framework that represented my research interest and involved specific attention to the viewpoints of each of the three actors and the three strands. The final result was a frame that displayed the interplay between all of these; the Contextual Consideration

Framework (Figure 9). On the page it appears as a fixed, static two-dimensional representation; yet if it was to be transformed multimodally and the components able to demonstrate dynamic activity, then actors could shift position to represent their specific focus of attention or major consideration and the strands could potentially change in proportional size according to the significance epitomised in any given context. The purpose of the framework represents my research interest in exploring both the use of text prediction and other digital technologies and my focus upon an exploration and analysis of the phenomena I encountered.

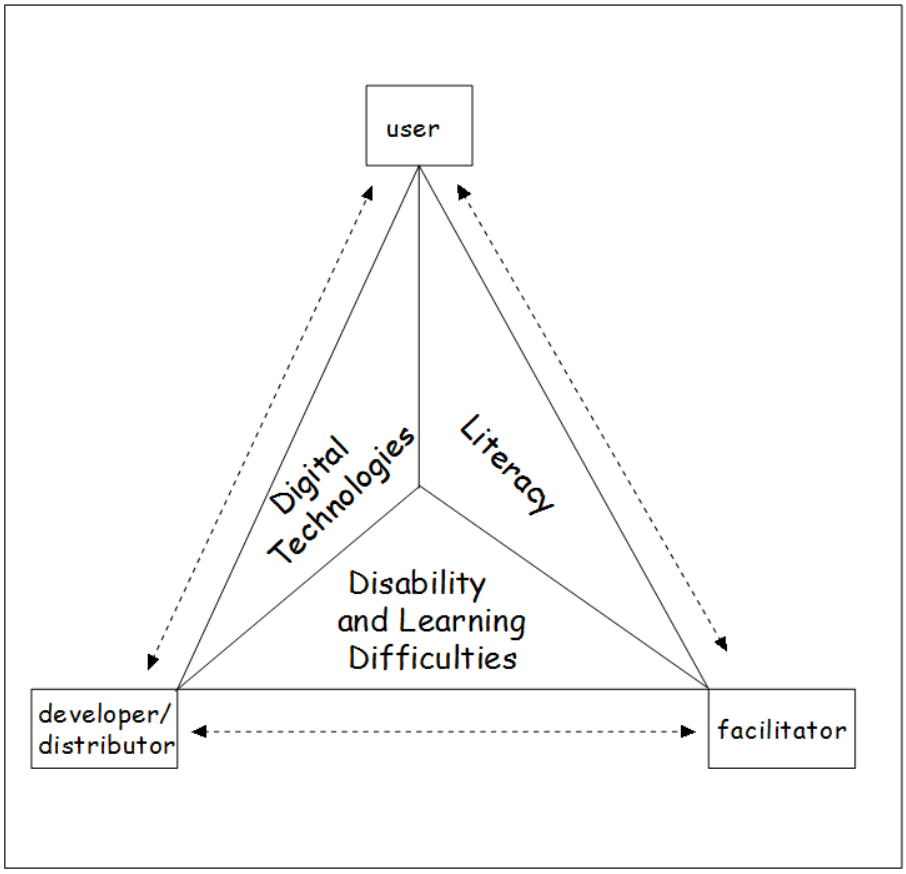


Figure 9: The Contextual Consideration Framework

4.1. Research Phases

With this framework in place, I then considered how to reach informants representing the three viewpoints of interest: those of Developer or Distributor, Facilitator and User. Developers and Distributors were potentially easier to identify but the other two roles were less so. In the early stages of my research any source of potential informants was already restricted because of my explicit focus upon text prediction alone (a facility that was not universally available). My specific emphasis upon its use only with younger children just beginning their pathways into written literacy complicated this further. Additionally, because I required the viewpoint of students themselves, I also needed to locate gatekeepers with whom I could negotiate potential access.

My initial idea of approaching developers to identify sites of use was abandoned as this could have led to my research appearing biased and product specific; a criticism I needed to avoid. Instead, I attempted to identify potential locations by breaking my research into two distinct phases, each requiring its own pilot study. Phase One was a trawling mechanism and entirely purposive in an attempt to identify and approach potential informants who would represent the viewpoint of facilitator (and potentially gatekeeper) with sufficient knowledge of text prediction use. I designed a questionnaire to be distributed to a large group of individuals, which would not only pinpoint those facilitating use but also identify the age of any student using it. The questionnaire also asked whether the respondent was willing to discuss this use in greater depth through interview and I intended to use this opportunity to then explore the possibility of potential access to students. The open-ended nature of all other questions was designed to generate responses that would help to frame subsequent interviews but to also provide additional background information that would contribute to the research data generally. The questionnaire was trialled in a Pilot Study (A) before being distributed.

Subsequently, the purposive nature of Phase One only identified four Facilitators. None of these had experience or knowledge of text prediction use with the age of student I was specifically focused upon. An alternative means of recruitment (which I will describe in more detail in the following section) was initiated to seek other participants for Phase Two. This identified further facilitators and eventually a gatekeeper providing access to children and young people. The second Phase contained the depth and focus of my exploration through the mechanisms of interview and observation. Field notes and some artefacts contributed to the triangulation of data from all three viewpoints. Three interviews were then undertaken for a Pilot Study (B) in Phase Two in order to explore how differing viewpoints, and the modes through which these interviews might be conducted, would affect the interview process.

4.2 Sample and Selection

The sample of data ultimately represented viewpoints from the roles of User, Facilitator and Developer and Distributor. However, Phase One intentionally only ever targeted those from the viewpoint of facilitation since this was the purposive stage of recruitment using a questionnaire to locate potential informants and gatekeepers to students. This phase required identification of those with knowledge of text prediction, a technology that was not commonly used. Yet this viewpoint also needed to be representative of use. Three potential target groups for recruitment were approached. The first target involved two professional UK-based, online, educational forums that covered interests and shared practice in technology, literacy, disability and learning issues. A second potential source for recruitment was contacted directly; individuals concerned with the support of students with specific needs in either an advisory or higher management capacity in local education authorities from contrasting geographic locations (urban and rural)

with differing demographic trends. These were identified either from professional knowledge regarding their roles or by using an LEA register of advisors. These professionals were asked if they could help with the identification and recruitment of potential participants from their respective LEAs. The third target were key informants drawn from my own professional network. These included professionals known to have an interest in the overlap between technology, literacy and the support of students with learning needs. However, whether their knowledge or experience extended to the use of text prediction specifically, was unknown.

Phase Two involved representatives from all three viewpoints. Initially I had anticipated that participants representing the facilitators' viewpoint would be drawn from the purposive trawl of questionnaires used in Phase One but when this approach only drew four informants (all from one forum) who had not used text prediction software specifically with younger children for developing writing, I had to reconsider my recruitment strategy. Therefore, I directly approached more individuals known through my own professional network in an attempt to elicit other informants or identify potential sites of use. These individuals were themselves authoritative figures working within the field of technology use and specific need. Although no-one was aware of any specific use of text prediction with younger children, some of these individuals were willing to share their own knowledge of a range of digital technologies, software or text prediction use with older students. Some also provided introductions to other facilitators. These further discussions made me realise that I was faced with a dilemma; either text prediction technology was simply not used at the emergent stage of writing or, if it was, could not be identified with the approach I had taken. Therefore I widened my focus within Phase Two and started to look at the use of a broader range of digital technologies rather than just explicit emphasis upon text prediction alone with users of any age.

By broadening my criteria, twenty-one respondents representing the role of facilitator were ultimately involved in Phase Two. All were involved in the support of digital technologies. Their roles could not always be explicitly defined. Some were employed across education authorities or worked independently. Others drew upon experience from previous employment. These collective views were educationally oriented but the individuals themselves were not necessarily working within schooled environments. They represented local education authority advisory centres, mainstream and specialist school provision (both private and state establishments) but also other support services such as charities not merely aimed at the provision of educational support. All individuals were involved in the use of technology, but some also supported other life and learning skills. Roles included: teacher, advisor, parent, support service worker, teaching assistant, advisory centre consultant, private tutor and researcher (see Appendix N). Collectively they represented a diverse body with many years of experience working with students and adults with impairment and specific learning needs across rural, urban and inner city locations. The advisory teachers or senior advisors alone represented six different local education

authorities but represented a much wider geographic distribution since some held roles that entailed professional interest beyond any immediate work location.

Four significant student informants represented the Users' viewpoint in Phase Two but brief observations of four other students in their schools also took place. Ajay, as a mature student at postgraduate level, made a significant contribution to the study; initially with Pilot Study B and, later, with subsequent email correspondence. I have drawn upon data from his contributions as a comparator to historical consideration and the evolving perception of disability. Steve, the focus of Chapter 5, was contacted directly after I learned of his use of technologies but all other students (primary and secondary) were introduced via their respective gatekeeper (facilitator).

Five developers/distributors contributed to the findings. I had contacted each of these directly, but had identified them by their reputations in the educational technology field either by the references made to the quality of their products through online forums, the depth of knowledge displayed on webpages beyond product descriptors or their achievements recognised within educational technology circles. These interviews took place towards the latter end of the data collection period, providing opportunity to gain a prior degree of understanding of digital technology use from both users and facilitators initially. Table 1 depicts this representation.

Table 1: Informants and Sources of Data (Phases One and Two)

Phase	Viewpoint	Number of Informants	Data Type *Key: F/F face to face* *TMI technology-mediated* *ITP intermittent time period*
Phase One *Pilot Study A*	*Facilitator*	*5*	*5 questionnaires*
Phase One **Main Study**	Facilitator	4	4 questionnaires
Phase Two *Pilot Study B*	*Facilitator* *User*	*2* *1*	*Interviews (F/F)*
Phase Two **Main Study**	Facilitator	21	Interviews (assorted F/F, TMI and ITP)
	User	4 4	1 observation with interview (F/F) 2 observations plus assorted F/F, TMI/ITP interviews 1 TMI/ITP interviews 4 observations
	Developer/ Distributor:	5	Interviews (F/F)

4.3 Nature of Data

A summary describing the nature of data is shown in Table 2. The data in Phase One was contributed through responses to the purposive nature of the open-ended questionnaire specifically designed to locate and identify those with knowledge of text prediction. This was distributed and managed through email, with all data received and stored electronically. The interviews in Phase Two were either conducted face-to-face or through technology-mediated modes (such as email or AAC). This data included audio recordings and observations supported with field notes. Some artefacts; such as examples of children's texts, were also examined.

These different types of data ensured reliability of measure in order to triangulate findings but in the true nature of ethnographic enquiry, my research journals provided another significant contribution. These not only recorded my personal journey of discovery, but were the place in which field notes and records of visits were described in *"solid description"* and contained the evolution of my thinking and analysis as befits ethnographic enquiry (Wolcott, 2009).

Additionally, four significant informants (three students and one facilitator) helped to corroborate and jointly construct some of the analysis from key findings through subsequent technology mediated conversations (email and Skype). These have been highlighted appropriately in the corresponding chapters.

Table 2: Nature of Data in Pilot and Main Study (Phases One and Two)

Phase One: *Pilot Study A*	*5 questionnaires (5 facilitators)*
Phase One: **Main Study**	4 questionnaires (4 facilitators)
Phase Two: *Pilot Study B*	*2 x1 hour interviews (Facilitators - face to face)* *1 x 1 hour interview (User –face to face and technology-mediated)*
Phase Two: **Main Study**	18 hours of recorded interviews with facilitators, developers and distributors
	4 hours of unrecorded interviews with users (field notes)
	2.5 days observation (field notes) in educational settings
	70 (approximately) email conversations with users and facilitators including three key user/informants (providing the intermittent, longitudinal aspect of the study)

	2 internet video/telephone calls and email exchanges to clarify participatory clarification with users

5. Design of Research Instruments: Phase One

Phase One involved use of an open-ended, self-completion questionnaire to try to identify sites where text prediction was used. Although I was aware at the outset of the risk of a potential low rate of return of questionnaires (Cohen et al, 2007), I needed a purposive method to sample for a phenomenon that was low in occurrence (Denzin and Lincoln, 1994). The questionnaire was specifically designed for this purpose and can be found in Appendix C. It included a question that would identify the age of the students using text prediction. This was critical for my intention to undertake a more detailed investigation in Phase Two exploring its use with younger children. Another question asked respondents to indicate whether they would be willing to be interviewed to explore their opinions further. Responses to all other questions contributed to the general background information used to further inform the study.

The invitation to participate in the Main Study (Phase One) was distributed through the three target sources identified earlier by means of an introductory email (see :85). In the case of the forums, this was a notice added to the weekly Notices; the preferred means of etiquette on such distribution lists (Appendix J). The key contacts in Local Education Authorities and personal contacts from my professional network were each sent a brief resume of the purpose of the study with contact details. This provided potential participants with sufficient basic information. Once any interest in participation was expressed, the informant received an information sheet outlining the purpose of the study in greater detail (Appendix D) together with the questionnaire. When completed and returned, these would each be given a unique identification code and filed securely.

5.1 Pilot Study A: Phase One

The design of the questionnaire was tested (Pilot Study A) with nine informants known through my professional network. They were drawn from various professional backgrounds but had all worked in roles related to literacy teaching. Their experience of technology use to support literacy needs varied and ranged from highly competent and respected practitioners within the field of technology and specific needs, to those only just beginning to explore software use. Any prior experience with text prediction was unknown; but all had indicated some knowledge of it as a term when initially contacted. Their responses served as a useful indication to the structure of questions, how they were interpreted as well as scrutiny over the general design of the questionnaire.

5.2 Considerations Prompted by Pilot Study A: Phase One

Five of the nine distributed pilot questionnaires were completed and returned. The responses to individual questions raised contextual considerations that culminated in a slight rewording of the document prior to distribution (see Appendix L which tables these specific issues in greater detail). A subtle change substituting the original term of word prediction to text prediction to cover all types of predictive text was required. The grid-based tool, Clicker, had been referred to in some responses, as one type of software, so this was added as a separate category since it did not use an algorithm to generate text. Text prediction on mobile phones was mentioned and had not been considered originally because younger children did not commonly use these devices. Even so, this question of clarification highlighted the need for text prediction on any device to be included.

Questions that involved experience of use were restructured in such a way that past and abandoned use could also be described. Of particular interest was the phenomenon of informants adding additional comments to an accompanying email when they returned a questionnaire or explained why they had not completed one. This was pertinent as these comments contributed significant contextual detail to any response. The Pilot Study confirmed, as expected, that the use of questionnaires was useful for basic detail but limited for any depth of exploration and reinforced my decision to make use of interviews to explore use in greater depth with informants.

The Pilot was analysed manually and responses to questions simply summarised. However, because each respondent referred to a different type of text prediction package, these needed categorising to ensure comparison was equitable. Six categories of text prediction were identified and are displayed in Table 3.

Table 3: Categories of Text Prediction

Category 1	text prediction as part of a suite of writing tools
Category 2	text prediction with speech, with prediction based upon context and smart spelling options (i.e. lefant for elephant)
Category 3	text prediction with speech, based upon context and spelling by initial letter entry
Category 4	text prediction without speech
Category 5	text prediction software no longer available
Grid Based	i.e. version of Clicker

An analysis of responses was tabulated into a simple matrix. This briefly summarised details from each questionnaire and indicated those related to contexts of use. These provided useful background information including age of user and an insight into its purpose. A brief summary can be found in Appendix O. Importantly these responses indicated that text prediction was perceived as a compensatory resource and provided the first tangible indication that, other than the grid-based Clicker, the technology was not used with younger children to encourage emergent writing development. It also demonstrated that, from a research perspective, any explicit focus upon the use of text prediction would be difficult to extract from the more complex issues of writing itself and the influence of the digital technology on which it was used. Responses indicated a wide time span in the age of software used and it was essential that my analysis within the main study would be able to cope with this. Yet it also drew attention to aspects beyond mere software utilisation to include degrees of awareness of individual learning needs and differing technologies in the classroom. All these topics could only be explored in depth through subsequent interviews.

A review of the Pilot Study invoked subtle changes to wording. This included an emphasis in the introductory notes emphasizing that my research was aimed at existing and past users of text prediction including any examples of use that had been discontinued. Unintentionally, some respondents had thought that my study was only looking at successful use. Their questions raising these issues were invaluable. They were contained within the email correspondence that accompanied a returned questionnaire and indicated that generating dialogue through this mode provided an informative, rich source of data. It prompted my initial thinking about data generated through online interaction.

6. Design of Research Instruments: Phase Two

Interviews and observation were essential research instruments in this study and they required careful preparation. The Pilot Study (B) for Phase Two involved three interviews in total. It began with two interviews that provided me with an opportunity to compare and contrast my interview technique with users of differing experience with technology. It also enabled me to judge the efficacy of using a structured or semi-structured interview approach. The third interview was conducted with another adult. This occurred much later when I had to consider the use of AAC in anticipation of interviewing children with differing communication needs.

Interviews were conducted with informants representing all three viewpoints and, as part of my initial preparation a list of potential themes was designed (Wengraf, 2001). These covered questions related specifically to the use of text prediction that subsequently were not always of relevance in all interviews (see Appendix K). Every interview was different and had to be planned and conducted accordingly, either because of the interests of the individual and the

types of digital technologies they used, their age (as in the case of the children), how the informants had been recruited into the study but also the mode though which conversation was mediated. To illustrate: interviews with one user and some facilitators were only ever conducted through technology-mediated conversations (which I will discuss in greater detail later). In contrast, the face-to-face interviews conducted with the four facilitators recruited from Phase One were based upon their written responses to a completed questionnaire. Most interviews were audio recorded. These digital files were then transferred and securely stored on my personal computer and the original data recording subsequently deleted from the recorder in order to maintain participant confidentiality.

6.1 Interviews and Pilot Study: Phase Two

Two of the three interviews conducted in the Pilot Study (B) in Phase Two involved participants representing the view of facilitators. These two interviews took place immediately after completion of Phase One, at a stage when my emphasis was still explicitly focused upon text prediction use with younger children. They explored use from two extremes of experience and facilitation. One informant was experienced with using and supporting a range of assistive technologies amidst assorted ages of students. The other was limited in her experience with the use of digital technologies generally and had only ever used one type of text prediction with a student. For reasons of expediency, a brief analysis of these interviews can be found in Appendix P, but the considerations these invoked are discussed here. I have then given greater emphasis to the third interview because it not only demonstrated the emerging and spiralling path of my research, but also raised questions regarding the assumption of speech in the interview process. In addition, it demanded further attention regarding the role of informants within research.

The interview process resembles a performance and the setting in which these are conducted can influence their construction (Bloemmart and Jie, 2010), so I gave attention to this by asking informants their preferred choice of venue. One of the pilot studies took place in an educational establishment and the other in the informant's home. However, entering another's personal domain significantly shifted the dynamics of the process and the need to consider whether acting the role of guest or host influenced the way interviews were constructed. These roles contributed to the performance element and were quite separate to any consideration of professionalism and knowledge between us. The first few moments were also significant and bore influence upon the process with regard to both parties feeling at ease. These pilot interviews were recorded. Each lasted approximately one hour and provided a benchmark for future planning. On reflection, they also proved to be the most formal of any interview subsequently undertaken but they usefully permitted me to experiment with structure and technique (Anderson and Jack, 1991) including how I posed questions and topics based upon the participants' response to the questionnaire. Each interview demonstrated that, despite my focus upon a specific technique (semi and

unstructured), these tended to shift along a continuum between both formats (Denscombe, 2007).

Each participant offered a distinct viewpoint. One was more experienced as a facilitator and displayed knowledge and confidence whereas the other was quiet and hesitant. Gentle probing had been necessary without emphasizing differences in our knowledge (Cohen et al., 2007). The contrast between these participants and their respective experience, combined with the interview process itself, illustrated the unique structure and style of every interview. I had to learn to trust in my own sense of the dynamics between any informant and myself and, where necessary, adjust my approach accordingly. It was essential to keep in mind that every interview should run along a continuum to suit a social encounter and never be seen as mere collection of data (Silverman, 2010).

These Pilot Interviews enabled Phase Two to commence but the purposive nature of the questionnaires in Phase One had only found four informants to participate. None of these used text prediction with younger children for emergent writing, so I had begun to seek participants for Phase Two by making contact with other professional colleagues. This direct approach generated far greater success in encouraging participation, yet even these subsequent encounters only continued to provide further viewpoints of facilitation. I did not meet anyone who had used text prediction with young children to develop writing. Instead, I continued to encounter intermittent 'pockets' of use with the technology that depicted a picture of some utilization, certainly not widely distributed, but with older children and young people. Discussions with facilitators often went beyond text prediction and involved discourse around other digital technology use and support and, initially, I merely attributed this lack of use with younger children to the fact that I had not encountered anyone else using the technology in similar ways. However, when this same response was repeated with informants with extensive knowledge of technology use in schools, I was forced to look critically at my approach. My research path was constantly reaching what I saw as dead ends through its limited focus upon younger children using text prediction alone. More importantly, I was actually missing the use of digital technologies that existed around me if I only stood back and looked. This meant accepting and exploring the research site I had stepped into rather than specifically seeking a type of use.

It was also evident that the most effective means of recruiting participants occurred when one informant provided a personal introduction to another. This was aptly illustrated when one contact led from a single meeting to a small chain of introductions; essentially leading to a facilitator who subsequently introduced me to the students depicted in Chapters 4 and 6 and provided additional opportunities to observe other children. This particular encounter was like a sudden trigger of engagement and illuminated a path to follow which illustrated:

> *"The main interest of the researcher in this mode is being open to the events of the research process and being able to pursue particular interests with gusto and to discard those avenues that seem less relevant or interesting."* (Jeffrey and Troman, 2010:542)

Contributing to this was another significant event that occurred around the same time. An email conversation with one informant had developed into an online dialogue between us. This discussion offered a rich source of data that demonstrated the value of conversation extended over time, rather than through isolated interview. These collective experiences made me re-evaluate my approach and take advantage of the opportunities placed before me; with the result that my study shifted direction with a rapid succession of introductions. I also deliberately cultivated the inclusion of technology-mediated interviews over an intermittent time period, which subsequently became an effective method for continuing dialogue with participants beyond any first meeting.

The catalyst to this shift had been the introduction to a visiting support teacher who offered the opportunity to accompany her on a round of school visits and meet some of the students she worked with. These children used a range of digital technologies to support their difficulties with writing caused by physical impairment or other learning issues, but some also used technology to support their complex communication needs (AAC). I had suddenly encountered a gatekeeper who offered access to children and young people using digital technologies but not necessarily the use of text prediction for emergent writing that I had originally sought. This unexpected contact led to experiences that enriched my research beyond its initial narrow focus and so, with the spiralling nature of enquiry, events progressed rapidly. It meant that for a forthcoming encounter with children and young people, I had only the briefest of background knowledge into their use of technologies. I discovered one was exploring the use of, what was then, emerging technologies (smartphones and handheld tablets) as a form of AAC. However, as I had not worked with children with complex communication difficulties for many years and never with any who had used AAC, I had very immediate, practical issues to consider.

I was assisted by another important influence on my research at this stage. Through a research seminar, I had come across an intriguing study. The author had incorporated three adult AAC users in an advisory capacity to explore a study into the role of identity and lives of teenagers who used AAC (Wickenden, 2010). Through the spiral of informants and contacts in my own investigations, one had earlier offered to introduce me to an adult using text prediction for physical issues and although I had originally set this offer to one side (because of my exclusive focus upon young children and their use of technology), this recent turn in events led me to consider whether talking to an experienced user would help prepare for this impending visit. So this was how Ajay initially became involved in my research. He was a mature student, studying

for a postgraduate degree and used both AAC and other digital technologies, including text prediction. Importantly, he agreed to become the focus of the third of my Pilot Interviews.

Although it may seem incongruous to have used an adult for a pilot study to subsequently interview children and young people, there were specific reasons for doing so. I needed to prepare for the potential use of AAC as one element of communication within the interview process. Of additional interest, was the realisation that some communication devices also incorporated text prediction into the construction of text. I felt it would be insightful to discuss this with someone who could not only demonstrate use but talk about some of the practical issues faced; topics that children might be unable to articulate. The subsequent interview did more than this. Our discussion included practical matters that invoked further deliberation regarding the multimodality of communication but, of greater significance, ethical considerations regarding how research is conducted and its purpose.

This unexpected turn of events shifted my research in both momentum and direction. I had to consider a range of digital technologies (not just text prediction) and include increased focus upon the contexts surrounding physical impairment and issues of disability itself. Subsequently, this initiated further deliberation regarding the use of AAC upon communication amidst emerging technologies and, initially, the complexity was a deterrent to proceeding further. Venturing into totally new territory involving AAC and a foray into emerging tablet technologies that I had never used, was just too daunting. It was unexpected, too unknown and held no indication of any specific direction. I hesitated but was also intrigued and decided to venture forth cautiously to see just where it would all lead.

Phase Two of my research, therefore, saw a significant shift in my depth and focus of exploration. I began to purposely include technology-mediated tools to engage and continue dialogue with some of the participants over an extended and intermittent time frame. Technology not only became the interest of my enquiry but the mode through which a significant proportion of it was subsequently conducted. The instigation of much of this was invoked by the third of the Pilot interviews.

Ajay had invited me to his home but I had known very little about him or his specific use of technologies before that first meeting; other than that he was an experienced user of digital technologies including text prediction and AAC, a fast switch user (preferring this for mouse control) and was able to use a joystick (see figures 10 and 11 for examples of similar technologies). There was much to learn in an initial encounter. It involved the use of digital technologies, including opportunity, access and support but also Ajay's expectations. It was this latter point that was the most significant issue and would ultimately influence my thinking significantly but none of this was in mind as I stood on the doorstep to his home that day.

Figure 10: An example of a switch to access and operate a digital device

Figure 11: One type of joystick used in place of a mouse

Ajay's emails arranging our initial meeting had been concise; merely a few words and I had attributed their brevity to his style of email construction and mode of text entry as an AAC user (Wickenden, 2010). Our face-to-face conversation was mediated through text generated by his AAC device, his own voice and other indexical features such as expression, eye and body language and movement; since Ajay's physical impairment (athetoid cerebral palsy) severely affected his motor co-ordination and speech. I will return to the way these influenced the conduct of our dialogue but suffice to say the first few moments of our initial encounter were critical. It influenced our subsequent communication but it also held the potential to curtail it. Since my approach involves an ethnographic perspective, I have incorporated the power of description from my research diaries into the construction of my writing.

On the afternoon of our pre-arranged meeting; I had arrived at the door of Ajay's home as apprehensive as if attending a first job interview. A young woman opened the door in response to my tentative knock. Ajay appeared in the corridor behind her; seated on a motorised wheelchair with a communication device affixed prominently to the front. After a brief nodded greeting, he signalled that I should follow and deftly manoeuvred his wheelchair as he retreated into the depths of the corridor. The woman disappeared into another part of the house.

The room we entered was sparsely furnished, but immaculately tidy. With accustomed precision, Ajay swung his chair into a position to face me. He reversed a little and signalled with the nod of his head and a wave of an arm to draw up the only chair in the room. Not a further word, sound or additional sign had been made. Ajay lifted his eyes questioningly and I immediately became aware that the next few moments were pivotal to the success or failure of this encounter. I had to rapidly establish some form of communicative rapport with a person I had only just met, an unfamiliar environment and where etiquette of interaction was an essential component in the manner in which any dialogue was to be conducted. The air was charged with uncertainty and the balance of power lay firmly in Ajay's court.

I always find the first few moments of any initial meeting with strangers daunting, particularly when invited as a guest into their home. It is not just the awkwardness of searching for common ground to initiate conversation, but the knowledge that first impressions are crucial. They set the tone for what follows and, in the case of any interview, its success or failure. I was more apprehensive than usual on this occasion as I sat under the scrutiny of Ajay's gaze and even more so when his first response brought the heart of disability activism into the room. He listened to my thanks for inviting me into his home, the brief outline of my research and then, like an indulgent father to a recalcitrant child, created the first words in our dialogue onto his communication device. He turned his gaze to me as I read:

" RESERCH OR MAKING A DIFFRENCE" [4]

The volley of those words stunned me (which I suspect was their intent), but it had the desired effect. This confrontation cut to the crux of research with the expediency of five words. What was my purpose and intention? Would the involvement, time and effort I asked of him have any tangible outcome? Could I guarantee that my research would have any greater purpose than the pursuit of my own endeavours? These thoughts spun in my head. I hesitated, as I slowly but truthfully answered that I did not know and it would be for others to judge. My response seemed to satisfy, because he slowly smiled, settled further back and waited for me to speak again as I felt the tension in the room gradually begin to subside.

This initial encounter with Ajay demonstrated his use of text prediction, other digital technologies and the frustrations he was experiencing with new software. The conversation was stilted; partly by my own continued apprehension but also by the need to become rapidly accustomed to the brevity of his responses. I knew that his contributions were likely to be succinct from my reading of Wickenden's work but I had not appreciated, nor been prepared for, the impact this would have upon the flow and construction of conversation. It was accentuated

[4] Following the style guidelines of Augmentative and Alternative Communication (AAC), capital letters have been use for digitised or synthesized speech device productions see http://sfx.cceu.org.cn/cgi-bin/tgxx.cgi?issn=0743-4618

by the fact that we had no shared understanding of one another's lives to even form a basis for polite, initial conversation openings. More importantly, every word Ajay composed required focus and sustained physical effort.

On reflection, those first few moments were critical and even though conversations or subsequent emails with Ajay were never as long, detailed or as casual as those with some other informants, his contributions challenged my thinking. I found the little I learned of his life fascinating as, subsequently, snippets were unravelled through our sustained and intermittent communication beyond this first encounter. These experiences went beyond any use of technology and became fundamental to my understanding of disability issues. I cannot understate Ajay's influence on my research because it invoked awareness, appreciation and particularly whether I represented or included informants' participation or researched 'about' them.

That day I learned that Ajay had recently replaced an older text prediction system but it had thrown up anomalies in the way that it functioned (ultimately a conflict with his switch system, yet this understanding did not emerge until many weeks later). Technological issues had persisted causing him immense frustration in any attempts to study, compose and submit university assignments. This aggravation continued until he finally abandoned the software altogether and replaced it with another system. However, he would never have been able to do so without the technical advice he received through a specialist service that supported him with his use of technologies. Again what ultimately happened was only learned through subsequent email communications, when Ajay explained issues in greater detail. During our initial encounter he had only briefly outlined the problems he was experiencing.

At a practical level of communication, Ajay's participation in my research highlighted important methodological issues. Despite the fact that he was an efficient user of his communication device, the discourse between us was slow and subject to misinterpretation. It took time for him to compose each construction of text in comparison to the speed of speech. He would enter a few words to form a phrase, but did not turn on the speech synthesis for the text to be spoken aloud as I had expected. Instead, he looked at me. I judged that this implied that I should read the text displayed from his device rather than hear it. However, I was unsure of his preferred etiquette; whether to wait until he had fully completed his phrase before responding (Murray and Goldbart, 2009) or semi-complete his words or phrases depending upon an individual's preference (Wickenden, 2010). I floundered initially until realising that he was merely waiting to see if I was able to understand sufficiently without having to enter more text, thus speeding up our interaction. Yet all this was only assumption. I hoped that I had read his body language and facial expression accurately and had to rapidly interpret the unspoken communication between us. The experience highlighted the incongruity of any meaningful discourse when one is unfamiliar with

another's style of communication. It was an issue that I needed to give serious thought to if I intended to talk constructively with the children.

The initial twenty minutes of our meeting felt awkward and uncomfortable. I was in the home of someone I had only just met and Ajay's first phrase had made me conscious that every word and expression was critical to the construction of dialogue. I was acutely aware of the immense physical effort he employed to contribute to my understanding by typing additional words or extending a phrase. I felt I was encumbering the conversation through my ineptitude. Ajay used some speech, odd words or utterances but I did not always understand these. His facial expressions and body language supplemented his text but there was no spontaneity in our discourse. He waited for me to ask a question directly and would then respond briefly. I would then add words to his short phrase to ensure that I had understood adequately, to which he would either nod or add further single words or phrases. It was a struggle to encourage the conversation and to try to make it flow. Muscle spasms affected Ajay's arm movements and, at times, would render him unable to reach his communication device. Yet, slowly, I began to understand more as I realised these constructions were more like text messages. They contained few verbs, with words and phrases abbreviated. As an example when we spoke about his difficulties with a specific product, he typed:

"(***) LOST WORDS"

and when I did not understand, he elaborated:

"SOMETIM DINT PREDCT"

Typing errors produced odd words or spelling that contributed to my confusion, until I realised that involuntary muscle movements might cause some of them. It was only much later and after further exploration of AAC use that I wondered if these had been contractions of words or spelling issues (Millar et al., 2004). These constructions made me understand the earlier brevity of his emails. It was difficult to read Ajay's facial expressions when it was contorted, but so much was still communicated with his eyes. I had to learn this mode of communication rapidly and later realised the extent to which I had missed meaning in the early stages of our conversation.

The spontaneity and nuances of communication without speech are difficult, if not impossible, to convey in text; let alone the sheer physical effort required to produce them and is something that those of us with speech may find difficult to comprehend. In an attempt to convey some element of this, I turned to the work of Jean-Dominique Bauby who, paralysed by a massive stroke and left in a state of locked-in syndrome[5], communicated with the only means left to him; the blink of

[5] a condition where the body is left paralysed but the mind still functions

an eye. Meaning was mediated through a communication partner reciting an alphabet strip, each letter positioned in a *"cunning calculation"* according to its frequency of use in the French language:

*"ESARINTULOMDPCFBVHGJQZYXKW" (*2008:27).

When the required letter was reached, a blink would signal its incorporation. In this laborious fashion, each construction of text would emerge, letter-by-letter, word-by-word and sentence-by-sentence. It was Bauby's sole means of producing verbal language and text. His memoir, "The Diving Bell and the Butterfly," was painstakingly produced using this system and the following passage in which he describes a visit from his young son, conveys the sense of frustration and loss he endured:

> *"Want to play hangman?" asks Theophile, and I ache to tell him that I have enough on my plate playing quadriplegic. But my communication system disqualifies repartee: the keenest rapier grows dull and flat when it takes several minutes to thrust it home. By the time you strike, even you no longer understand what had seemed so witty before you started to dictate it, letter by letter. So the rule is to avoid impulsive sallies. It deprives conversation of its sparkle, all those gems you bat back and forth like a ball – and I count this forced lack of humour one of the greatest drawbacks of my communication." (Bauby, 2008:79)*

Can words ever convey any semblance of the sheer physical effort required to conduct any form of communication through AAC; the painstakingly slow composition of its structure and the impact that this has upon any attempt to conduct the nuances of everyday casual conversation; the loss of spontaneity, humour and flippant jest? Some of Bauby's terms are poignant, conveying the loss of his own physicality. Ajay helped me determine a suitable methodology, he contributed to my data but I never felt that I could ask him, even after a year of intermittent communication, for help to comment upon the sheer effort required for the construction of dialogue and interaction.

Our initial conversation, therefore, had begun slowly and clumsily but as I became more accustomed to Ajay's style; my understanding grew, I noted that wit and humour were part of his repartee. I could see this through the sparkle of his eyes but I could also sense it. Facial expressions and other signals, such as a wave of the arm to indicate an object, were critical to any understanding. He made me appreciate that time was always going to be a significant factor and that one off interviews with anyone who used AAC was not a productive means of discourse. Snippets of issues were cast in our initial meeting but these were only ever fully explored and

finally understood through subsequent email communication, yet they had been crucial to any understanding of specific need and digital technology use.

6.2 Considerations Prompted by Pilot Study: Phase Two

As a result of these experiences, I found that I needed to give far greater depth of consideration to any use of interviews. They are commonly associated with spoken discourse, but in this enquiry they required various modes of communication. Complex communication needs affected the speech production of two key informants but the construction of discourse in every interview differed. Ajay used his AAC device but he preferred to use its textual component (display) rather than speech generation. In contrast, a communication partner supported my initial conversation with Nick (focus of Chapter 6) but only to enhance my understanding not his construction. Later, further discourse took place through email and once through Skype telephony when the latter did not require the aid of any communication partner because text could be used to clarify misunderstandings.

I realised that users of AAC made a unique contribution to the understanding of both text prediction and digital technology use because specific types of speech generating devices required the creation of a text frame (with alphabetic text) to aid communication. Thus, for some, this mode of communication was based upon alphabetic text. Additionally, Ajay's involvement led to my exploration of AAC and its well-documented research base (Koppenhaver, 2000; Light and Mc Naughton, 2008; Newell and Alm, 1994; Zangari et al., 1994). This prompted new deliberation including any further understanding of literacy as a concept or the nature of disability issues within research itself. Our initial conversation had been conducted with Ajay using his AAC device but, like other AAC users, this was only one element of dialogue since signs, gestures and speech approximations were a significant component of communication (McNaughton et al., 2008; Smith et al., 2010). On a practical level, a fundamental issue was now the allocation of time for interviews. I had always tried to ensure (out of courtesy) that interviews did not last longer than an hour but if responses needed to be constructed on an AAC device, this contributed to the time factor[6]. Time to pause added to the time required, yet was a necessary component of discourse in order to create the next verbalization on the device. Communication through AAC, therefore, was going to be slow and quite unlike the immediacy and rapidity of spoken discourse (Bauby, 2008; Murray and Goldbart, 2009).

Issues surrounding fatigue also needed to be considered since communication through AAC required both physical and mental effort to participate (Williams, 2000). It also involved muscle control and the concentration of physical exertion appeared to exacerbate or trigger muscle spasms that sometimes impacted upon Ajay's control of his device and subsequent construction.

[6] Wickenden (2010) suggested that language production with AAC users flowed at a rate of approximately 5 -20 words per minute, compared to that of 150 for those using speech.

The significant effort he applied demonstrated why communication through AAC lacked spontaneity or the *chatter* of spoken discourse (Wickenden, 2010). I also needed to consider how I constructed my questions and recognised that this might lead to responses that might appear short or incomplete and possibly led to misunderstanding or misinterpretation (Churchill, 2000).

Later, in the Main Study, discourse with Nick invoked further deliberation. Although his speech was severely affected, Nick used his own voice but this was difficult to understand if unfamiliar with its production. In our first encounter, it was perceived that I might be the one unable to keep up with conversation (rather like a new language learner amongst native speakers) and to compensate for any potential inability on my behalf, Nick's mother acted as a communication partner. Her quiet repetition of his words supported my understanding but it did not slow Nick's pace or, as far as I could tell, the actual language he used. These experiences contributed to the realisation that 'technology–mediated communication' (such as email) would provide an additional means of furthering enquiry and enable contribution and clarification with some participants. Yet it also helped with issues of distance, time and accessibility for any participant. It became an invaluable methodological tool.

Interviews, regardless of the mode in which in they were constructed, were an essential part of my research because it was only through these that I was able to explore some topics in greater depth. Yet, as a research tool, their use warranted further deliberation. One way to mitigate the accusation of over reliance upon interviews was to include other data as a means of triangulation (Fetterman, 2010). Some observation (involving the use of technologies) was feasible occasionally but there was little opportunity to corroborate historical use based upon personal reflection. These conversations led to the construction of knowledge but they could never be merely considered as factual report (Green and Bloome, 1997) and this was important to acknowledge in a study that focused significantly upon the preferential mode of discourse with reliance upon what was said as an expression of reality and truth (Briggs, 1986; Silverman 2010). Site visits, either to a student's school or their home, took place but there were practical issues to contend with, like technologies not functioning on the day of a visit or even, as occurred once, never actually being used. Therefore, the subsequent use of furthering dialogue through technology-mediated means provided an additional avenue through which corroboration could be achieved. It also became a valuable means to engender further collaboration.

Interviews never presented a quick method of collecting significant amounts of data (Briggs, 1986), particularly when the site or identity of informants supporting or using text prediction technologies remained so elusive in its early stages. However, once my focus shifted to wider digital technology use and age of user, interviews generated a multitude of data that needed to be selectively refined (Wolcott, 2009). The consideration of the indexical component of language, rather than over reliance upon the referential, lead to further insight and different levels of

interpretation (Briggs, 1986). Analysis was also focused, where appropriate, upon the way content was expressed and any further interpretation that this might provoke. Features that offered such meaning appeared in the form of gesture, syntax or intonation, which Briggs referred to as "*stylistic cues"* (ibid) also offered the potential to signal unspoken language or sentiment. These features were of interest in all interviews, but of fundamental importance to the communication process of those for whom speech production was more complex.

I also thought about the "*cognitive"* aspect of the interview regarding any comparison of respective knowledge bases, both from my own position as well as my informant (Cohen et al., 2007). When I entered the research arena, I tried not to be influenced by my own perceptions or previous experience. Yet, the reality is that research is never really value free. Some of these issues have been expressed earlier about being conscious of my own presence at all times within the process (see :81). However, rather like a teacher undertaking research in her own school, at times I was entering places, not just physical locations, which were entwined with my own professional working space and this required constant reflection regarding any influence this might exert.

Face-to-face interviews always took place in the informant's preferred venue and included the settings of a classroom, private home, public venue or office and sometimes allowed for observation of technology use. Digital audio recordings of most interviews took place to ensure accuracy (Lareau, 1996) but unlike a video record, these could not convey nonverbal information. Reliance upon a digital recorder, with some field notes, was far less intrusive (Cohen at al, 2007) but sometimes only a few notes were taken in the interviews themselves. I did not want their production to influence the construction of discourse by appearing to seem of particular significance (Wengraf, 2001). Maintaining attention and as much natural interaction as possible was essential. Notes, therefore, on these occasions were constructed immediately after the event; usually by recording them into the digital recorder for speed whilst the process was still fresh. My digital recorder, therefore, became an essential tool for many aspects of my fieldwork.

Not all interviews were audio recorded because there were occasions when this did not always feel appropriate and I was then reliant upon field notes that were again rapidly expanded into greater detail as soon after the event as possible. The digital recorder provided an efficient method of note taking with the added benefit that it could be transcribed through speech recognition software later. Notes were also added to my research diaries and used to write detailed descriptive pieces as part of the process of ethnographic enquiry. Although the lack of audio recording sometimes meant that accuracy could be questioned, the richness of particular episodes far outweighed any sense of lack of precision of actual words and would have inhibited the dynamic nature of discourse and the way that it was conducted.

I have demonstrated this with three specific examples. I met Ajay (Pilot Interview B) in his own home where he demonstrated use of his digital technologies. At the time I had felt it insensitive to audio record the visit and was still able to capture detailed notes afterwards; a decision that I have never regretted. On another occasion, time spent with Ann, a visiting support teacher and gatekeeper to students' voices, included a long car journey together, shortly after meeting. During this time we chatted casually and generally discussed her role with the young people she supported. Again, this was an unrecorded conversation and although some elements were recaptured the next day, simply as a means to identify the needs and contextual histories of students, our dialogue was not as rich as the original conversation. However, the chance to establish a rapport had been invaluable. The final example involved my visit to Nick in his home (Chapter 6). There had been no previous contact with him or his family before this invitation, yet the warmth with which I was made to feel welcome was overwhelming. Two hours rapidly passed in a setting that resembled an encounter with friends rather than researching. These experiences influenced my selective use of the digital recorder. With Nick, in particular, I believe that had that initial encounter been recorded, the relaxed atmosphere and richness of dialogue would have been compromised. All three incidents drew attention to the fact that interviews have to be negotiated and constructed; yet good manners, as well as sensitivity to the context, need to be part of any research process.

6.3 Other Research Instruments: Making Use of a Research Diary

My research diaries were an essential part of enquiry: providing opportunity for reflective practice and reflexivity as part of the research process itself. Field notes were expanded into these to support the descriptive process but these were more than an assortment of notes on the data being explored; they were a record of the development in my thinking; a place I could take time away from and return (Nias, 2002). Using Wolcott's (2009) advice that writing should always be undertaken at the same time as fieldwork and not as a separate process, my diaries became a site for this and the descriptions of context, which open each of the following chapters, were drawn from these. Interestingly, I nearly always wrote by hand, a point to which I will return in my final chapter. My diaries included thoughts on texts being read, glimpses into a direction or focus at any one moment in time and a record of my meandering approach towards themes, questions and issues. Returning to their content intermittently and recursively throughout the process was insightful and part of my methodology, but returning to them as I wrote was essential. They held the basis for contemplation and described its journey. They were a personal site of recorded enquiry and a place to which I constantly returned.

6.4 Other Research Instruments: Using Blogs, Forums and Personal Websites

I also need to briefly discuss my use and citations from personal blogs or web pages. This is important because I felt that this was a grey area, without clear guidelines in academic literature. Yet, it is of particular significance given the rapidly changing opportunities for publishing and

accessing material online exemplified by online forums, social networking sites, YouTube, blogs and collaborative writing. Even though it could be argued that such formats, once they have been published openly on the web, are situated in the public domain and become an accessible document for anyone to use with citation, I preferred to take this one step further wherever possible, and sought permission of the author of such material before using. For me, this was an ethical issue but also one undertaken through courtesy.

6.5 Other Research Instruments: Technology-mediated Conversations

An essential means of conducting and furthering enquiry in this research involved use of 'technology-mediated conversations'; an umbrella term I created to encapsulate any form of communication using electronic media. I preferred this to the term CMC (computer mediated communication) referring to communication and social interaction online (Warschauer, 2006) which I considered restrictive in the context of the technologies through which communication was mediated since, in my research, they did not necessarily involve a computer. I required a broad term of reference that would include asynchronous modes of communication such as email and their attachments (which took place over time), as well as synchronous (in the same time frame) voiced conversations through the internet (Skype) and its message facility. The term also covered other modes of communication that included AAC on both traditional communication devices and emerging devices such as tablets and smartphones.

Email was used as a mode for discourse, but even though this may be seen as a relatively new research site in some disciplines, there is nothing new about email interaction since it predates the emergence of the internet (Lightfoot, 2006). However, the value of an ethnographic perspective to further research using online discourse may be considered an emergent field. In this research, rather than drawing data from just one interview at one given moment in time, it facilitated communication over the intermittent time mode. This benefited my research in a number of ways. My ethnographic perspective facilitated focus upon specific topics and with email used as a mode for inquiry; it was easy to ask informants to clarify issues thus ensuring accuracy of meaning or extending contemplation further. With participants who continued their participation in this way; it became a model for collaboration that was useful for all parties concerned. It was both convenient and efficient; permitting a longitudinal perspective rather than one isolated snapshot of use. This flexible approach offered benefits to all parties giving time for both reflection and opportunity to reinterpret, reframe and consolidate data (Denscombe, 2007).

Online interaction was also useful because informants were widely dispersed across geographic distances. It not only reduced the necessity for prolonged and repeated periods of travel (Fetterman, 2010) but a physical meeting was not required; another important factor. This increased choice and flexibility for participation. Some informants preferred this mode of

discourse when it was offered in preference to a face-to-face meeting, whilst others were merely happy to continue conversing or clarifying issues through further technology-mediated conversations after an initial encounter. For those whose participation in the research was mediated entirely through email; an introduction from a third party, such as an organization or a professional contact; instigated or bridged the introduction. Therefore all interactions resulted from some form of tangible connection having been previously established.

This method may have lacked the spontaneity of spoken discourse and was slower to construct than speech, but it had other benefits. It enabled brief glimpses into my informants' lives without becoming over-intrusive. Its construction sat somewhere between written discourse and conversation and was generally less in quantity than speech (Denscombe, 2007). However, the quantity and style of text varied between long extended pieces to brief responses. It was an efficient means to engage in discourse but also conducive as it seemed to draw conversation with some. Yet it required structure and revision to make best use of it. I would email a message containing a social conversation opening within the introduction, along with questions or clarifications that may have arisen from previous dialogue. As I did not want to assume too much of any informant's time nor lose the sense of rapport that had already been established, no more than three points were addressed in any one communication. I wanted informants to feel they could "*chat*" (Fetterman, 2010), so I thought very carefully about what and how I wrote, because once words were committed and sent, they held visible permanence that spoken language did not. With some informants, communication naturally ceased after two or three exchanges but with others, it extended intermittently over time. Sometimes informants emailed me but usually I was the one who initiated the next bout of communication. Thus the intermittent time mode that had begun spontaneously was established and purposely continued until such time as I felt it had run its course. Then, a final communication conveying my gratitude signified the end of the participant's involvement.

One aspect that was particularly useful with this mode was the opportunity to extend a topic or make clarifications of understanding. With an isolated face-to-face interview, I might return to a recording long after the event and think of a question that I wished I had asked at the time or in light of other experiences. With email, I could do so with impunity, and without losing continuity, because the conversation was already intermittent. These communications lost formality as they continued, to the extent that latter exchanges could certainly be described as 'chats'.

Essentially, the inclusion of this mode of discourse engendered discourse. It offered the chance to gain longitudinal data to examine, rather than just historical or immediate use that the one off interviews produced. Without it, some of the data would not have emerged and a very different picture of use would have been presented. I would not have captured the changes that occurred with some informants' use of specific technologies over time nor the depth of personal story that slowly developed with others.

7. Theoretical Concepts

A set of core theoretical concepts around the strands of disability, literacy and the use of digital technologies informed the design of my research but it was also shaped and influenced by my informants and their needs. My earlier consideration of the theoretical concept of Disability in my literature review had explored the epistemological shift from a historical medical model of personal deficit to one that encompassed social and cultural consideration. It was therefore essential that my research involved individuals, did not treat them as objects to be researched upon and employed methods that enabled their participation.

The use of Digital Technologies was not only the focus of my research but also the mode through which much of it was conducted. I used digital technologies to communicate with my informants, to engage in dialogue but also for the creation and recording of data and analysis. In turn, my informants used their own digital technologies in ways that represented their own everyday modes of communication whether it was voice and the use of speech recognition or text typed onto an AAC device. These represented examples of digital technology use but also communication through the creation and sharing of meaning. Thus the theoretical concept of Literacy was entwined with this use.

My consideration of the theoretical concept of Literacy involved Multimodality and invoked focus upon the cultural expectation of the use of speech in interviews. My informants' voices were heard through various modes. My Pilot Study interview with Ajay had demonstrated that I needed to give significant attention to the construction of every interview and be responsive to the use of modes that suited each participant. Some interviews involved the use of technologies, some were conducted through them (such as with AAC) and not all involved a face-to-face meeting.

In its exploration of the theoretical concept of Literacy as a sociocultural construction, my literacy review invoked attention to related concepts of Multiliteracies as well as Multimodality. Again all of these were woven into the methods I employed. Much of my research was conducted through and with language both in spoken and textual format but email conversations and the use of AAC devices with some informants required the ability to construct alphabetic text. On an AAC device these constructions were sometimes contracted and I needed to be able to understand and interpret these accurately and efficiently. However, communication does not always involve words and the concept of Multimodality was again evident in gesture, intonation and other linguistic signs. All of these contributed to meaning within the concept of Multiliteracies. Multimodality was also evident in the modes used for discussions' particularly email correspondence but also, where practical, via telephone or Skype (online video telephony). Speech could be taken for granted in the interview process in some disciplinary fields but Ajay's

involvement and subsequently some of the children highlighted just how complex and fragile the process of communication could be.

An illustration of this was Ajay's preference to personalise communication by using text on a screen when I had initially expected it to be emitted through the use of the speech-synthesizer on his AAC device. Yet, this contrasted with observing the children's use of small mobile technologies with emerging applications as alternatives to traditional AAC devices in later encounters. The way devices were utilised therefore invoked theoretical concepts of Universal Design and Assistive Technology; not only to try to describe the device but how these were used within social interaction. These demonstrated an individual's ability and their means of engaging in social interaction not attention to personal deficit. Yet this use also involved personal preference. Again these theoretical concepts could not be viewed in isolation.

Time was required for dialogue and to mediate different styles and preferences with some informants but also to encourage depth and detail with others. My evaluation of the limits of single interviews and decision to include modes of email interaction helped with this. I also included the intermittent time mode to pursue dialogue through online interaction because this mode again supported many users' needs. Thus the concept of Literacy was not only visibly examined within my research but also used to conduct it. However, Ajay had initially asked if I was undertaking "*research or making a difference.*" The phrase continued to reverberate and impacted upon my thinking. My conversations with Ajay invoked reflection and deliberation. It had been induced by an impending visit with children and considering the best way to conduct interviews with them, but his words became pivotal to the way that I then approached my entire investigation.

8. Data Analysis: Phase One

Data collection for both Phase One and Two took place between November 2009 and October 2011 (including Pilot Studies). This time period was significant because it placed into context the types of digital technologies already available but also those that were just beginning to emerge. Phase One (Main Study) took place in the first three months with four questionnaires completed and returned. This low response rate could be analysed in two ways. Either the use of the questionnaire had taken the pulse of a phenomenon (Fetterman, 2010) and found it used with less frequency or transparency than anticipated or the method I had used was simply ineffective. Yet, this phase was purposive in design (Silverman, 2010) and all four participants responded positively to the question asking if they would be willing to discuss their experience with text prediction use in greater depth in an interview to be undertaken within Phase Two.

For this phase of the research, the raw data from each questionnaire was analysed thematically at a basic level to provide an indicator of emerging themes or patterns (Cohen et al, 2007;

Fetterman, 2010, Silverman, 2010). This was later used to contribute to the general background information regarding digital technology use. An illustration of this analysis is included here (Table 4) with an example that considers responses to the question addressing perceived benefits of text prediction use from the facilitator's viewpoint.

Table 4: Early Analysis of Data: Phase One

Question 6: What have these students gained from using text prediction? **Raw Response:**	**Issue**	**Initial Analysis:**		**Basic Theme:**
Recording becomes less tiring…leading to an increase in the quantity of independent recording	a. writing as tiring, b. measured by amount c. does the student usually work independently?	Reduced effort (fatigue) Increased quantity of text Independence		Barrier (fatigue) Perceived Benefit - Productivity Independent activity
Improved quality of recording – not just the words they KNOW they can spell!	a. writing = recording b. writing = spelling	Improved use of vocabulary Less "safe" spelling		Vocabulary (matching oral language) Spelling
Improved self-esteem as its use enables them to record independently.	a. Why is self-esteem low? Writing alone?	Improved self esteem Independence		Self-esteem Independent activity
Improved reading fluency (reading wordlists all the time!)	Not just about writing – requires ability to read – any speech support?	Reading fluency increased		Reading (required)
Up to 50% faster writing speeds (particularly switch users).	a. Looking at physical access for those with disability issues. b. Type of switch in use?	Increased writing speed (physical issues)		Productivity
Confidence in writing and reinforcement of spelling	Confidence in what part of process? How is spelling reinforced? Writing = spelling	Confidence Spelling reinforced		Self-esteem Spelling
Definitely confidence in	Transference of	Confidence in		Self–esteem

their ability to get their thoughts down on paper.	thought to text Ability + confidence levels	ability Thoughts to text		Independent activity
For some there is a transformation, as they go from having to be coaxed to get even a few simple words on paper, to filling pages of good quality text – using the language normally confined to their oral expression.	Note – not immediate but a process of change Quantity of writing. Discrepancy between language used orally and textually.	Independence Increased productivity Using oral vocabulary in the text.		Independent activity Productivity Vocabulary/expression (matching oral language)
We have seen it give pupils more confidence when they do write on paper too. *We feel this is because of the way they have to think about the sounds in the words in order to get the required word to appear in the predicted lists.* *This seems to give the reinforcement of their phonic work necessary to be able to "have a go" even when not using the program.*	Writing on screen and paper. "We" – who is we? Phonic ability required for algorithm to function. Writing = phonics = spelling / transference from program to paper	Transference of skills – screen to paper. Requirement to think about phonics. Perseverance Willingness to try/engage		Skill transference Reading/spelling Self-esteem/perseverance Independent activity

The raw responses from four facilitators appear on the left. Initially, each point was simply summarised and then given an elementary analysis title (illustrated in columns two and three). The final column shows the descriptors and the emergence of a basic theme, whilst Table 5 shows the issues raised by the analysis. Some of these issues were subsequently explored in further depth within individual interviews.

Table 5: Questions Raised by Analysis

What is happening to the individual? (Facilitator Viewpoint)	**What support or compensation is offered? (Facilitator Viewpoint)**
Independent activity	Reading

Perseverance	Spelling
Self-esteem (confidence)	Vocabulary (oral language ability visible in text)
	Reducing task load (physical or cognitive?)

9. Data Analysis: Phase Two

My ethnographic perspective involved a deductive process that required capturing and analysing data in an on-going and iterative process in order to identify the subtle themes and patterns as they emerged (Wolcott, 1994; Fetterman, 2010). It also demanded the use of description and so I captured the path of my enquiry and outlined my *"thinking on paper*" within research diaries (Wolcott, 1994 :24). Over a period of eighteen months, interviews and observations took place with participants representing all three viewpoints. The transcription of interviews was undertaken as soon after the event as possible in order to ensure accuracy of data and to capture my initial thoughts and memories early in order to prevent these diminishing or becoming contaminated by the passage of time (Briggs, 1986; Lareau, 1996). I also recognised that a voice of opinion regards the inevitable transcriptions that result from these events as:

> *"Decontextualized, abstracted from time and space, from the dynamics of the situation, from the live form, and from the social, interactive, dynamic and fluid dimensions of their source: they are frozen" (Cohen et al., 2007:267)*

Yet the method I used to transcribe these retained the voice. The process used software[7] that framed the audio file and displayed it visually alongside any transcription; thus allowing coding through selection and segmentation (see Figure 12). Colour was used to highlight potential themes in the audio (displayed on the right) and the textual transcription. As an example: anything related to my focus upon the theme of *Amanuensis* was highlighted in green in this segment. The software allowed easy identification at any point on the audio file for further attention.

[7] Audio Notetaker

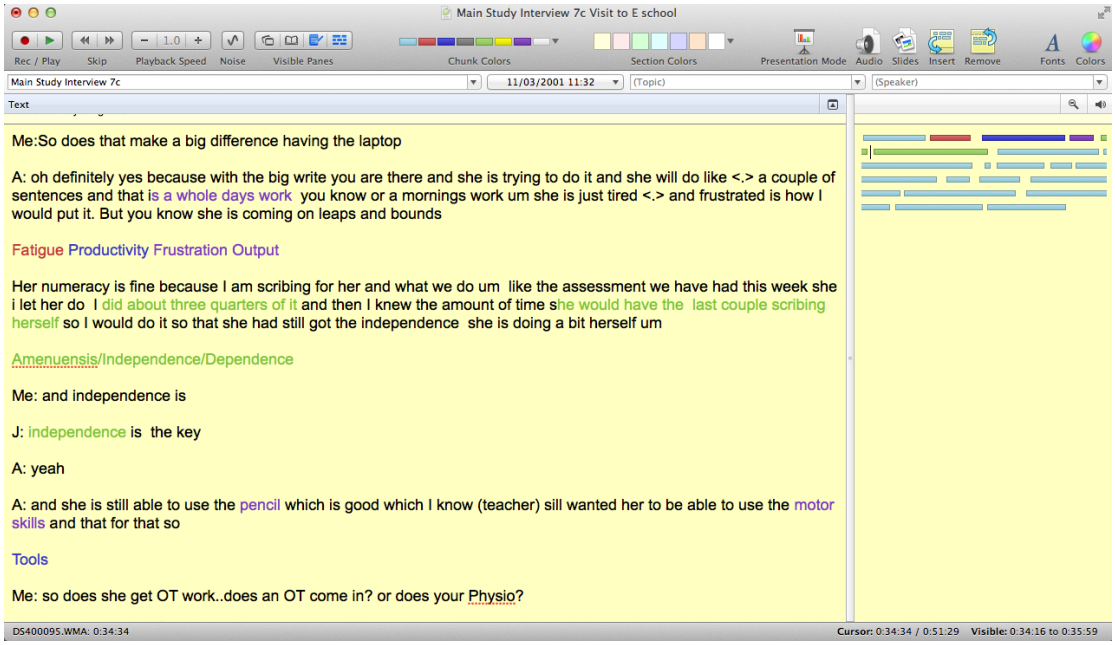


Figure 12: Transcribing Interviews through Audio Notetaker

By incorporating this software into my analysis technique, I felt that transcriptions were neither frozen nor decontextualized because the voice remained. They had not been reduced to text alone creating capital above other modes (Cohen et al., 2007). As part of the analysis process, I preferred to listen to voices rather than read transcriptions. The audio maintained the vibrancy of speed, intonation and timbre of speech that I found far more insightful and questioned the need for transcription given the ease with which one can now access and present the multimodality of data. The physical process was labour intensive, so the convention of transcribing multimodal material into monomodal meaning was not without irony in a thesis where the concept of Multimodality was woven throughout. I may not have captured each event by video but listening brought each to life again rather than allowing the voices to fade away.

Ethnography requires the ability to work simultaneously on many patterns but then to focus upon manageable topics (Fetterman, 2010), so both transcription and audio data were held within a frame with the descriptors (codes) of emerging themes. These represented content analysis or an elementary categorisation. These were also colour coded into the visual appearance of the audio file, providing visual access to relevant sections in the recording whenever I needed to return to them as part of the cyclical process of my enquiry and analysis. Additionally, I could easily add annotations, such as the insertion of field notes, onto the screen where relevant. This made it very easy to identify and work with relevant sections that related to a particular theme whenever I needed to revisit these multimodal files[8]. The example shown (Figure 13), demonstrates how emerging themes were initially identified from a section of

[8] N.B. Later editions of Audio Notetaker now offer the facility to add separate columns for themes, fieldnotes etc. which simplifies the screen further. However, this was not available at the time this analysis was undertaken.

interview with one facilitator as she described her experiences working with a student[9]. The initial titles of:

- individual need = individual choice
- cognitive load
- student reluctance
- persistence/motivation
- amanuensis

were amongst the emerging descriptors initially identified in this segment. However, over time, and with constant analysis and comparison with other data, these descriptors were ultimately refined. As an example: "individual need = individual choice" illustrated in this segment eventually became consolidated with examination of other data from different interviews to and entitled "*Individual Consideration"* which identified the match of technology to individual need.

[9] To try to simplify the screen in this earlier version of software: "I" signifies the Interviewer's voice/text and <> the emerging theme. All other text is the voice of the informant.

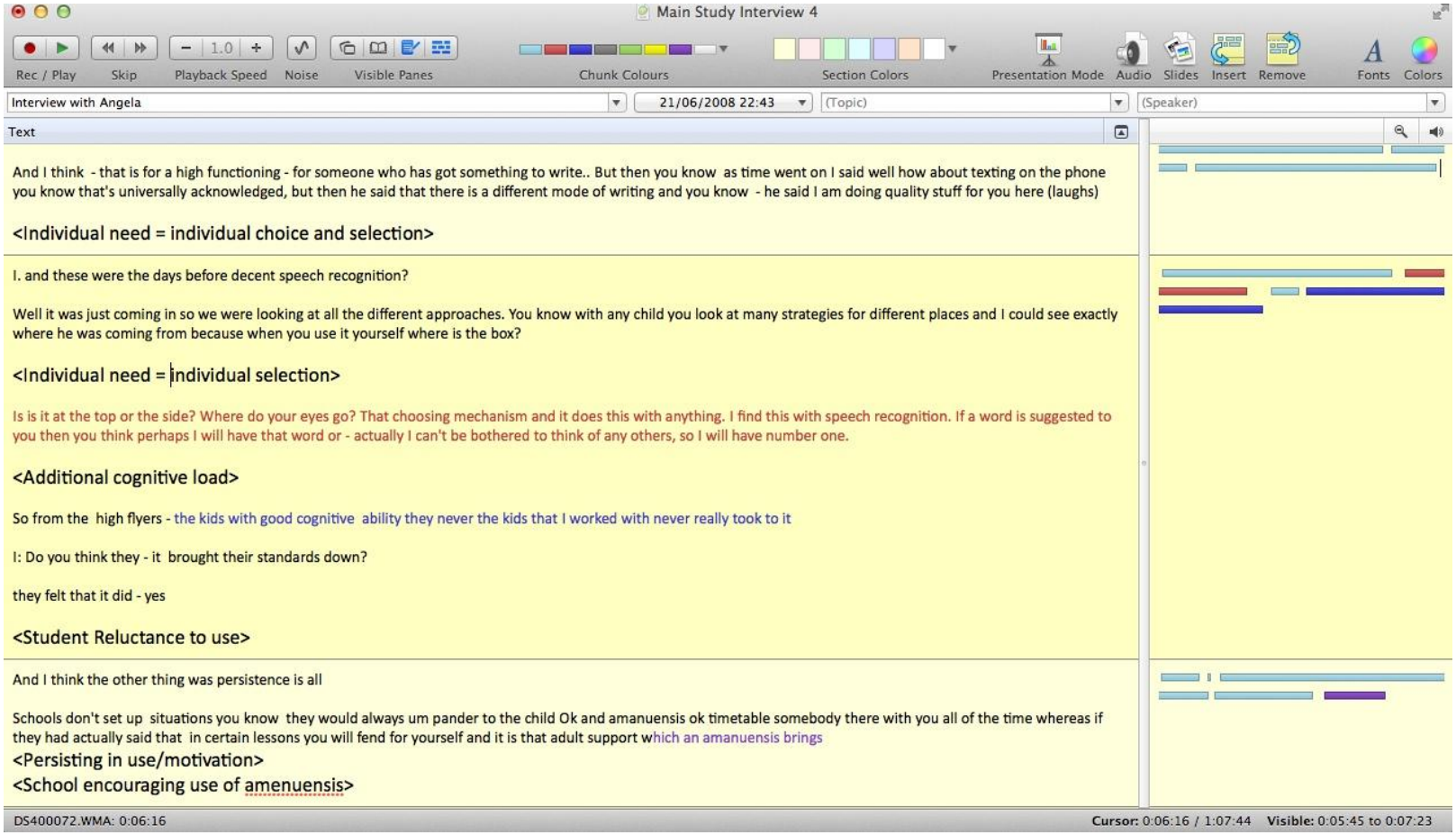


Figure 13: Interview with Angela (Facilitator)

A similar process was undertaken for dialogue generated through technology-mediated conversations, an example of which can be seen in Table 6. Previous email discussions with this user (Steve) and his facilitator (his mother Annie) had concerned the use of specific software for speech recognition. As part of my reflection and deeper focus, I had wanted to explore this introduction of software in greater depth with both of them. I was interested in how a young child could be encouraged to learn to use this software despite the complexities involved. This conversation provided opportunity for the emic viewpoint of both user and facilitator to be portrayed and then examined. I then considered and analysed Steve's use (an example of etic reflection) that I shared with them both. This resulted in further dialogue that led to considering factors that differentiated individuals who pursued and used technology despite the barriers and hurdles they faced. I later re-examined this when I looked at the character traits of users who took charge of their own learning and persisted in use. In the example depicted here, the early stages of this process are apparent within the emails. The emerging basic themes have been simply categorised. This example also demonstrates the iterative nature of my analysis as I honed into a particular topic attempting to seek greater depth and clarity.

Table 6: Technology Mediated Conversation Analysis

Extracts from Technology Mediated Conversations with Annie (Facilitator) and Steve (User):

In an early email to Steve I had asked:

By this I understood that it wasn't your school(s) that introduced you to it? I also got the impression that you had a lot more to say about how teachers, schools reacted to its use….

Steve: September 2010

I learnt to use speech recognition at home and against the advice of my teachers. Generally speaking, the attitude from my school towards speech recognition has been very negative I'd had to persevere and be assertive. The first school tried to use it in was a specialist dyslexia school. I was not allowed to use in the classroom and had to go into another room when I wanted to use it. The school has participated in trials of speech recognition software but this was during a period where speech recognition was too underdeveloped to be accurate so the general opinion was that it wasn't any good. However I did have one teacher who noticed a rapid improvement in my work since using speech recognition.

This particular teacher supported me using speech recognition by letting me use his office to work in. The second school I went to was a mainstream school but with a dyslexia unit. The unit staff, despite having multiple copies of (***) in the department, did not know much about it and were not particularly encouraging of its use. As for the rest of the staff, many didn't even know such technology existed.

Steve subsequently suggested that his parents would be willing to contribute. This first response from his mother, Annie, identified some basic details regarding Steve's use of technologies:

Annie: September 2010

- Steve was at (name) an independent specialist dyslexia school when he began to use VRT and other assistive technology.
- We took this path against the advice of the school which had been involved in some early trials of VRT software (***) for dyslexic children which had poor results (This was the only time we had a difference in opinion with that school which was, in every other way, excellent)
- Trying VRT was the "final countdown" as handwriting and typing were impossible for Steve, in spite of being taught appropriately

  He was also getting very frustrated and beginning to developmental health issues. We felt we had to try to take the pressure off and this would only be done if he was able to use his intelligence.

- My husband did a lot of research on the Internet and computer magazines. (Company) gave us good practical advice, particularly that we should learn to use ourselves first before we tried to teach him.
  In our research we came across a charity specialising in assistive technologies (Charity). We arranged an appointment and this enabled Steve to test (***). We didn't know if it would work for his voice and this opportunity showed us it did, without expense for us and added pressure on him.

Later, I came back to this issue and wanted to explore this further with Annie so I asked:
Q: One of the other issues which "hit" me really was how on earth did you manage to keep up the motivation to stick with SR in those early days (Steve's and yours) – especially as the software was so cumbersome. Was it the encouragement and support you gave him as a family, his personality …. I am really interested and full of admiration.

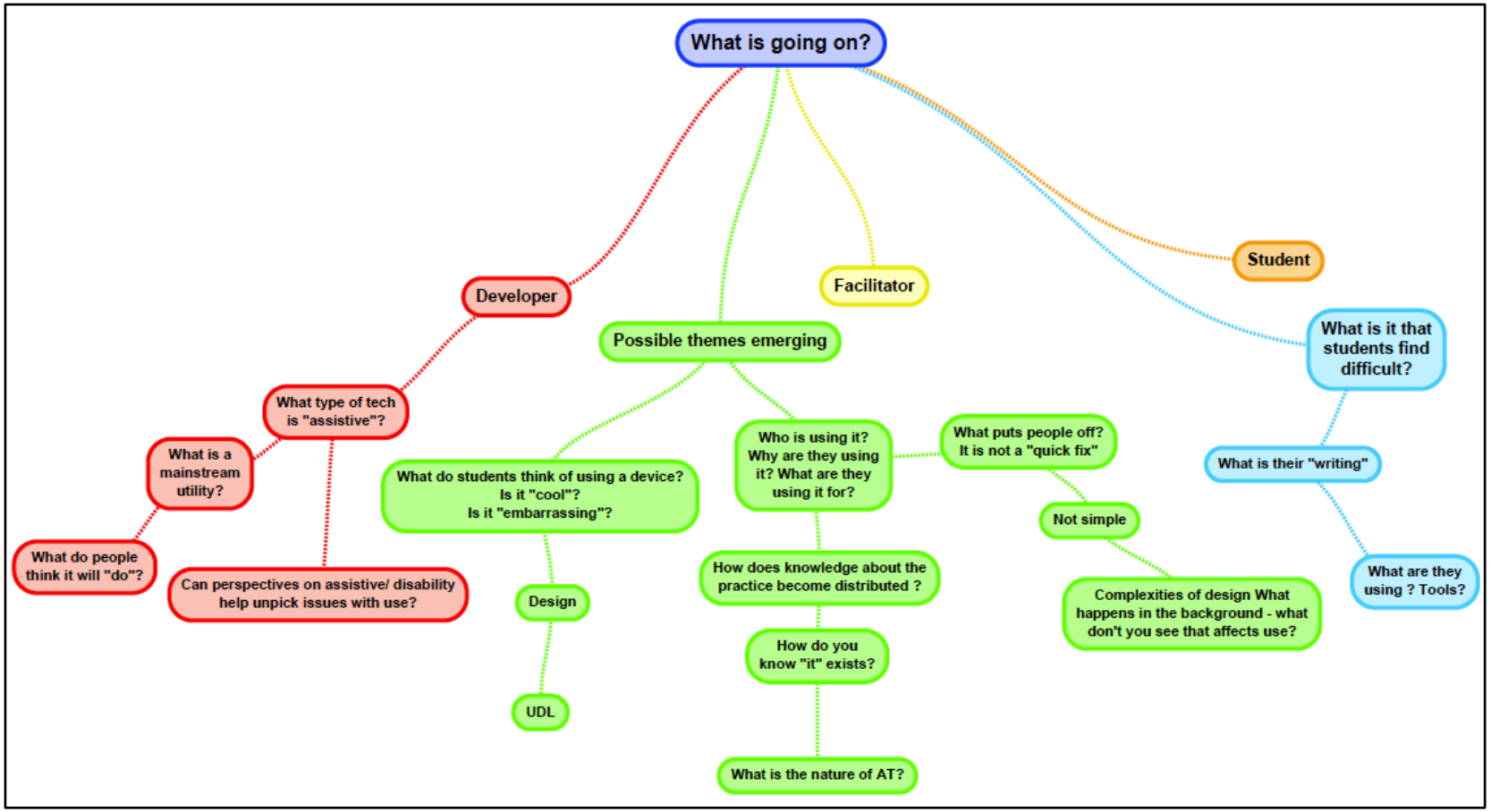
November, 2010
Annie: The motivation was totally Steve's. Obviously, we did the investigating, bought the software and learnt to use it ourselves, but we would not have pushed him if he had not wanted to go along this path. He was desperate to learn and produce written work that matched the ideas in his head. Steve learned with Version 5 of (***) The initial training was for twenty minutes and didn't have to be done all in one session, so it was manageable. The biggest difficulty was he couldn't read very well and I had to whisper what was on the screen and he had to repeat it into the microphone. The training passages were difficult, even those taken from children's books and we struggled and with "Charlie and the Chocolate Factory". Accuracy wasn't as good as the current versions but it certainly wasn't bad and when he went back to school, the quality of his work rocketed. Our experience is that with motivated parents, a motivated child can learn: perhaps people only want "easy" nowadays"?

Basic Themes: motivation/parental support/frustration/ability/training issues/student and parent knowledge/driving force/literacy support

Headings of emerging descriptors were collated at the end of any interview, email or description but as the data grew, I was able to make comparisons. Initially I considered each viewpoint separately but later merged these together. It was very basic, but I found it easier to comprehend any emergence of themes by representing these visually upon a large sheet of paper (that eventually stretched across the kitchen worktop). I have described these as 'Thought Trails' as they were a means for me to visually track my thinking, the questions this raised or issues prompted by specific encounters. The format built upon Wolcott's idea of portraying strategies graphically (2009 :84).[10] Table 7 recreates part of one and I draw the reader's attention to the elements highlighted in red and green which show the development behind my consideration of the question: *What was the technology thought to be addressing and why?* (seen here as 'What is going on?'). These 'Thought Trails' were repeatedly returned to, contributions added, elements shifted or redrawn and it was in this manner that I eventually found it possible to slowly review my data (and my thinking) as systematically as possible from the sheer quantity that rapidly gathered. It was still "messy" but this only epitomised the nature of ethnographic enquiry (Heath and Street, 2011).

[10] Wolcott used the analogy of a tree as a means of visualizing a 'Portrayal of Qualitative Research Strategies Graphically' (2009 :84).

Table 7: Thought Trail Illustrating Emerging Descriptors and Questions



Some of my thinking was also recorded in descriptive passages within my research diaries. I was able to return to these for further reflection whenever necessary. Extracts from these are woven into my thesis. Slowly, through this recursive process, I was able to focus upon specific themes that emerged across sources of data and delve further by pursuing some topics in greater detail. Three of the major themes that were examined in this kind of depth are presented in my thesis. These examine *the barriers* facing students as they tried to use digital technologies, *the tools* they were expected to use to demonstrate their writing ability and how *knowledge* regarding the use of technologies was initially accessed and then developed.

Wolcott's analogy of a *"bird by bird"* approach to analysing data (2009 :103) also helped me find a means to present these themes coherently from the quantity and complexity of data I had accumulated. By closely focusing upon only a small portion of the total activity, I found that my descriptive task was manageable and I could support my findings by zooming out to *"capture the broader perspective"* (ibid). The reader will discover that each of the subsequent three chapters illustrates one theme through the explicit focus upon a story of specific and individual use of technologies but it is set amidst much wider analysis. In each chapter, I have focused upon a description of the 'story" before trying to unravel the complexity of issues through analysis but, in following Wolcott's advice, my interpretation has been saved for the final chapter.

One final point is important. One of the issues in presenting qualitative work is the choice between using the informant's own words and, for reasons of efficiency, a descriptive account of their narrative (Wolcott, 2009). I have combined both within a style that I felt best conveyed the context and the pace of a story at any particular time. I have written in the first person because it was my preference, but also because the practice "*reflects a belief that impersonal language intensifies an author's stronghold on objective truth*" (ibid :17). I approached my research by being amongst the individuals I focused upon. However, they not only contributed to my research but also participated within it; they were not researched upon. I have tried to represent my participants' voices through the style of writing I have adopted. Any detachment from it by use of the third person, I felt, would have detracted from my portrayal of this shared sense of involvement.

10: Summary

This chapter has described the framework for my research. It began by looking at the theoretical perspective upon which it was built, its early stages as a qualitative investigation and my subsequent move towards adopting an ethnographic perspective. I have described the term ethnographic perspective and how this differed from perceptions of traditional ethnography; I justified my reasons for its use and explored the benefits the perspective brought to the research

process. I have also explained why, in the light of early findings, my research ultimately focused upon digital technology use across ages rather than text prediction with young children beginning to write that I had originally set out to explore.

My research sought representation from three differing viewpoints. This required breaking my research into two distinct phases to try to locate these. The first phase involved the completion of questionnaires as a purposive sample amongst the group representing the viewpoint of facilitation and I found limited evidence of text prediction use with younger children. As a result, I shifted my focus in the second phase to the wider use of digital technologies across a broader age range. This phase involved users, developers/distributors and facilitators. Pilot studies for both phases have been described and analysed, but particular focus has been given to one of three interviews because it prompted further consideration of research methods. I have also examined some of the key issues surrounding research that involves children and issues of disability and impairment.

The chapter also described the use of technology-mediated conversations and the selective intermittent time mode. The combination of these provided an alternative or further means for some informants to participate in the research other than through face-to-face interviews. This flexibility not only resulted in prolonged participation with some informants but also provided opportunity to document a change in technology use over time. I have then described how different types of data were examined, the iterative nature of my ethnographic analysis and included examples to illustrate the process. These also illustrated my own use of technologies in documenting my analysis and findings. Finally I have explained how the sheer quantity of data was reviewed and ultimately represented in the following three chapters which will each focus upon a specific theme through an illustration of use with those who have adopted specific types of technologies for their own personal needs.

Chapter 4: Theme One: Learning Difficulties, Disabilities or Barriers

1. Introduction:

The first of the themes I have focused upon in the following chapters concerns issues that have the potential to affect the consideration and implementation of digital technologies, including text prediction with students with specific needs in schools. It focuses attention upon the needs of one student and looks at the environment in which she was situated, her classroom activities and the roles of the individuals who supported her. A degenerative condition impacted upon this child's strength and endurance, but the use of digital technologies has enabled her to produce text independently. The chapter highlights the differing perceptions towards her using these digital technologies and how this affected how they could be used for classroom activities. In addition, it highlights barriers (perceptual and actual) to digital technology use and how their existence has either created or exacerbated any concept of difficulty or disability.

This chapter presents an illustration of digital technology use drawn from the viewpoints of both user and facilitator. An introduction to an LEA advisory support teacher (Jan), led to an invitation to accompany her and meet some of the students she supported. For two days, I accompanied Jan as she visited students in their schools and home. The chapter focuses significantly upon observations made during one school visit and the subsequent discussions held with both the student concerned (Kate) and her Teaching Assistant. I have then drawn upon data from interviews and observations with other informants to embed this within a wider consideration of use.

2. The Context

Kate, a ten-year-old student, used her digital technologies to participate in the daily classroom expectation of written activity. These helped to support her physical needs as her ability to produce text was compromised by the effects of a degenerative and debilitating condition (spinal muscular atrophy). The condition affected Kate's muscle tone and physical strength. It also caused periods of excessive fatigue and had contributed to her requiring the use of a wheelchair since the age of four. Kate had access to a laptop with a supportive writing package (which included text prediction) but it had not necessarily been used or viewed as an expedient or accepted alternative to all handwritten text in her schooled context. Environmental issues, but also the result of human perception towards the suitability of technologies for some literacy activities, have created barriers to use and have impacted upon when and how her technologies could be used.

The term context runs throughout my thesis and frequently in relation to concepts of inclusion, a consideration of the term disability as well as the perception of the literacy ability of individuals. In this chapter, I have specifically considered elements within the learning context and focused upon issues that have become, or have been perceived to exist, as barriers that negate a positive and enabling learning environment. These have included specific personal issues that relate to linguistic or cognitive ability, as well as the physical and sensory needs of the individual. However, these can also be influenced by the demands of the task or activity and the environment in which it takes place. Smith (2005) identified these as the *"intrinsic"* or *"extrinsic"* factors which need to be considered in order to increase participation in literacy activity for those with complex communication needs in order to reduce *"barriers to active participation"* (:163), whereas Hawkridge and Vincent (1992) identified and classified similar issues explicitly as *"barriers to learning"* in the context of the use of technology to support learning. My research used this categorization in order to map a breakdown of categories or themes that emerged from a consideration of my own findings and focused upon those that negatively impacted upon the use of digital technologies. These were made into a working framework and are depicted in Table 8.

Table 8: Comparing "Barriers" with Data Themes

"Barriers to Learning": Hawkridge and Vincent (1992)	**"Barriers to active participation" Smith (2005)**	**My Research Focus**	**Categories/Themes arising from my Research**
Individual Needs	Intrinsic Factors	Inclusive Practice Awareness *(in the setting)*	Physical Cognitive Emotional Social Perceptual
Environment	Extrinsic Factors	Accessibility and Availability of Resources including Digital Technologies *(for the setting)*	Location of use Training and Support Perceptions Technical Issues Financial Cost
Nature of the Learning Task	Extrinsic Factors	Literacy practice *(of the setting)*	Expectation Practice Perception Awareness Assessment

For the purposes of this chapter, I have specifically concentrated upon only one of these categories of 'barriers' from within this framework, the Environment, and focused upon the availability of resources, with a specific emphasis upon accessibility to digital technology use observed and discussed during my visit with Kate. Five categories emerged for consideration:

- Location of use (physical)
- Training and Support
- Perceptions (towards the inclusion of digital technologies by agents within the context)
- Technical Issues
- Financial Cost

The barriers Kate faced included those of a physical nature (the physicality of extrinsic factors) and the attitudes she encountered (perceptions) of others regarding the tasks in which she used her digital technologies. Her experience was not unique and set amidst examples of use drawn from a broader consideration of other informants. It is important to emphasize however, that unlike the following two chapters where data was captured over a much longer and intermittent period of time, Kate's story was drawn from an isolated visit into her learning environment.

3. Kate's Story: Literacy in School

Kate's Story:

> *"We had sat together in the corner of the cluttered room; three adults and a ten-year-old girl. The girl had been withdrawn from her classroom to meet with us and we followed as she deftly manoeuvred her electric wheelchair around the obstacles of the school corridor. Eventually, we reached what appeared to be some sort of resource or small teaching room, its area almost totally occupied with four tables pushed close together into its centre; cupboards and shelves overflowed around its edges. By hastily removing chairs and other obstacles; a space was created for the girl to guide her chair into the busy room.*
>
> *She sat in her chair, her laptop initially rested upon her lap. It looked far too heavy and bulky for comfortable use and there was no tray on the chair to place it on. The tables in the room were too low for her electric chair to fit beneath, or to provide a surface high enough for the device. We subsequently supported its weight so that it did not rest on her fragile frame.*

Images and text bounced around the screen before us. Together, under her teacher's tutelage, they created an exemplary text. Her teaching assistant sat to one side, rapidly attempting to jot down notes onto a paper page, trying to find text for the visual images and directions that flashed onto the screen. The sound of the pencil could be heard as it raced across the paper, lingering on the audio recording. I watched the actions, and the girl's reactions, to the screen.

At first, the girl was quiet. Her words were softly spoken when she was asked a question or uttered a comment. Occasionally she fluttered into an animated response, like a fragile bird, but then drew back into a quieter calm. She seemed mature for her tender years and resigned to the bustle of activity around her. She was interested in the task but not unduly perturbed by the attention of three adults pressed with her into one small corner of the disorderly room. The software seemed to function adequately, although a glitch or two required adjustment by the teacher when the girl's touch did not quite make the interface respond as anticipated. When pressed for her opinion on the application, the girl was shy and hesitant to respond. I learned more about her use from watching.

Later, away from the hustle and bustle of the school context, I thought about the scene and the concept of accessibility, materially and perceptually, of the function and purpose of the software's use. Accessibility was not merely about being given a device, but the context in which it was used. So just how accessible was a laptop that was too heavy to use on a lap, when its portability was lost with defunct battery life and when practices were as fixed as the power socket on the wall? (Diary Entry, March 2011)

A focus upon the themes regarding the types of support and technologies considered in this study began with the individuals themselves: the choice of technology they used, its suitability for the task and the context in which it was set. My diary entry was written shortly after meeting Kate. At ten, she had been the youngest of the central characters in this study, but although she had initially appeared to be quite shy managed also to convey an aura of maturity and resignation. My visit captured only a snapshot of her use, so it differed from the extended use of other students upon whom I have focused. It was only one encounter in one moment of time, so it lacked the luxury that the opportunity of repeat visits to refocus and re-examine. I have needed to consider

some of the issues it provoked in recognition of this limited knowledge. Some of these issues are discussed in my analysis within this chapter, but others will only emerge through subsequent interpretation of my research in the final one.

Kate used a laptop computer with a specific type of writing support program that included text prediction. She had only been using these for a few months but in her Advisory Support Teacher's words (Jan): *" really does use predictive type really well"* (Jan, Interview, 2011). Kate's debilitating condition had caused muscle wastage and impaired her mobility, requiring her to use a wheelchair. Her condition had continued to deteriorate and at the time of our meeting, she required total care in school. Kate's upper body was progressively weakening, which meant that although she still had sufficient muscle strength for some activities, such as feeding herself, she was no longer able to use a pen or pencil for any extended periods of writing. Jan had introduced the use of digital technologies in the hope that these would enable Kate to produce text independently in her present environment, but more importantly, in anticipation of future needs and later schooling as her strength and condition deteriorated further. However, despite the significance of such severe medical and physical needs, Jan had found it difficult to encourage Kate's teacher to comprehend the reasons for supporting the use of the laptop for writing as an alternative to the paper and pen that the other children used in classroom literacy activities:

> *"…… although she can hold a pen she can't do any extended writing at all now. When I first started working with her she could and I had a little bit of well why are we using a computer because she can use a pen for her handwriting. She will forget how to write and all the rest of it.*
> *They have now realised that she is getting weaker all the time and that even typing is hard work for her because, again, initially they were against her using predictive type because they said that was cheating because it is giving her too much help. And I was saying no she needed predictive type because she would get weaker and that she wouldn't be able to do all the key presses. And if they really wanted to know what she could do, just make her do a couple of sentences with prediction turned off and that would give them a measure of what her writing was like without predictive type." (Jan, Interview, 2011)*

Although Kate could sustain the use of a pen or pencil for very short bursts of time, it was not a productive means for her to produce written work and it was also important to note that she preferred to use the laptop. Her use of digital technologies also enabled her to work independently so that she need not depend upon her TA (Ann), as an amanuensis. With a pen, it could take a morning to construct only a few lines of text. Ann still acted as an amanuensis with

Maths because it was more problematic for keyboard entry, but digital technology use had offered Kate a means of textual production for other subjects. Keyboard entry required less physical exertion for her than handwritten text and text prediction was also available if she wanted to use it. However, any act of textual production, even with the use of technologies, was still exhausting. With Kate's physical condition inevitably deteriorating further, it was essential that the skills she learned in her present schooled context were given ample opportunity to develop before she moved into secondary schooling where the demand for written production would increase.

The use of the laptop and software was therefore a recommendation from Jan (in her LEA advisory role for student support), based upon her considerations and observations of Kate's needs. However, she had encountered negativity and a limit to understanding from the school amidst concerns that not only would Kate forget how to write by hand, but that the use of predictive text itself constituted '*cheating.*' These were initial concerns but they had not entirely evaporated as my visit discovered. These were similar tensions to those that Jan had encountered in other contexts and ones I had heard from other sources. They are issues to which I will return, but for the moment however, I wish to consider what Kate had been given to use and the environment in which she was situated.

4. Potential Barriers: The Environment

Part of the provision of Special Educational Needs funding, which existed in England at the time of this research, involved the facility for the full assessment of students' needs in order to obtain access to appropriate teaching, support and material resources. The receipt of funding required referral and involved a long process of assessment by professional services. Resources requested, or placement within a specific school, were not necessarily guaranteed in any outcome. This topic is explored in further detail in the following chapter but, at this stage, it is important to note that the process has since been regarded as unduly complicated (DfE, 2011c) and has led to reforms that began to occur during the latter part of my research period.

Kate's mainstream school received financial support to cover the employment of two full-time teaching assistants to care primarily for her daily needs (total care) but as this was the maximum funding available, the school received no further allocation of monetary funding for material resources from this provision. In order to purchase the writing support software she used, Jan had successfully lobbied the LEA for an additional sum, but it was then left to the school to provide the hardware. The school allocated an old laptop computer that had previously belonged to a member of staff since practice within the school involved passing on older laptops for student use when staff received new ones. Paradoxically, Kate owned a newer, publicly funded laptop for use at home. It had been funded through a separate Government project, The Home Access

Program, designed with the *"explicit intention to help address social inequity, and to provide opportunities for local education authorities to raise the quality of education for all"* (Jewitt and Parashar, 2011:304).

Therefore, in both contexts, Kate had a publicly funded device to use. At home she had the new laptop with internet access provided for a year but, within school and where most of her writing activity took place, her use was relegated to an older device that was not only slow, had limited battery life, required access to a power socket to function and could barely be described as portable. It was also bulky, so she could not use it on her lap because of its weight. Therefore Kate could use digital technology in school, but only in situations where she could physically access it and where there was access to the power socket.

Relegating older machines to students who might have benefitted with modern, faster and more reliable machines that could have enhanced opportunity for greater productivity and efficiency demanded significant consideration, since it was not contained to this school alone. Other facilitators referred to the assessment process with regard to resources for students. It appeared that if a specific allocation was written into the statement of need, then the school was statutorily bound to make provision for it. Funding for the actual software could be borne by the funding process but this did not mean that the hardware on which it was to run, was necessarily included and supplied. Amongst the facilitators I spoke with, there appeared to be little consistency in funding or allocation of technologies to support students with specific needs, so the problems Kate experienced were not unique. Each case varied according to the context in which any informant was situated and exemplified the piecemeal approach to provision for students with specific needs in primary schools described in the unpublished Gorton et al. report referred to earlier (see: 63).

To illustrate this specifically, I have drawn upon interviews with other advisory teachers from different local authorities who indicated specific issues within their LEAs. One suggested that some schools in her LEA were ill equipped with adequate physical resources or with technological knowledge to even know how to implement a resource that they were legally obliged to apply. Allocation of computers also depended upon individual schools' methods of resourcing technology. Sometimes there were simply insufficient numbers of available computers to allow one to be allocated specifically and individually to a student with specific needs for use in his own classroom, and where the only available provision was from either a suite of laptops that were shared by the whole school or fixed within a computer suite from which computers could not be moved. This meant that, in some situations, computers were only accessible to students for timetabled periods throughout the week, leaving a school struggling to locate a machine to use with a student for whom specific software had been recommended. In another situation, a school

had been unable to add the specified software to its existing computers because they used a suite of preloaded devices.

These different scenarios exemplified the types of barriers that faced schools needing to provide specific digital technology through the allocation of resources written into a student's statement. Invariably, as had been the case with Kate, some schools would find a means to provide the hardware but usually with older equipment. It was not a state of affairs that some of the senior advisors with whom I spoke, and who championed the use of digital technologies for students with specific needs, were comfortable with:

> *"I suppose my worry is that Special Needs departments tend to be the Cinderella when it comes to IT provision in mainstream schools. I will get wry smiles when I refer to outdated computers being passed onto the Special Needs Department! Persuading IT purchasers to make software for a small minority a priority, when budgets are under pressure, will not be easy and if you are not confident and knowledgeable enough to be persuasive, then the request may be dismissed." (Paul, LEA Advisor, Interview, 2011)*

> *"It is easier in a Primary except they often have no or insufficient technology available in the classroom for when pupils need it, only in a classroom suite or a mobile trolley of laptops that is timetabled. We often persuade them to use a standalone laptop and it is inevitable they offer the oldest and slowest one they have. So much for prioritizing SEN" (Adele, Senior Advisor, email, 2011)*

These comments illustrated that Kate's allocation of a faltering laptop to use whilst in school was not an isolated incident. It contributed to deliberations whether schools merely failed to prioritize implementation of digital technologies because they were unaware of the availability of supportive and compensatory technologies, or merely failed to recognise the specific needs of their students and measures that could be implemented to enable productivity and support learning.

4.1 Potential Barriers: Location of Use

On the day of my visit, I had only been able to observe Kate away from her classroom, but learned that the classroom layout had been reconfigured to ensure that she was part of a group so that

"*the other kids sit around her"* (Ann, TA, 2011), rather than an original position where she had sat away from the other children. This consideration was important for students like Kate who not only required additional space to manoeuvre and position a wheel chair under a higher table top than others in the room, but risked social isolation as well. It required ingenuity to consider the position of a child and their technologies into a classroom already crowded with thirty children, at least two adults and the usual melee of classroom furniture, particularly if it involved further bulky equipment. This image contrasted significantly with another visit where the child in question had been physically mobile, but also equipped with a hand held tablet technology that had been set up with text prediction software which he used both as a speech device (AAC) and for some written activity:

> *"We entered the classroom to find him. The room was light and airy, with the walls attractively adorned with displays of the children's work. The children were seated in groups around tables in settings of six to eight, well spaced with room to move around easily. It was a busy classroom; but a sense of order and industry hung in the air. One or two of the children looked up as we passed by, but they were obviously used to adults coming and going, as they soon returned to the task before them. Amongst the melee of faces and bodies two adult figures slowly became apparent, one kneeling with children at the corner of a table, another sitting amidst a larger group. Jan spotted the child. Mingled amongst the many faces sitting around a table, a mop of hair encased a bright face with a cheeky smile that came into view as he looked up. If I had been more observant, I might have seen a small tablet device on the table before him, but it was not until he was asked to bring it along, that I even noticed it was there." (Diary Entry, March 2011)*

In this scenario, the small tablet device was little more than the size of a mobile phone and slipped easily into his pocket. It was with the child wherever he went within the school and contrasted significantly with the heavy device that Kate used.

Kate wanted to use her laptop for written production, but it was also important to note that not all students were like her. This was an essential consideration in implementation and use. It was an issue raised by another Senior Advisor who commented that some of the children she encountered resisted using desktop computers with specific software set up for them in their settings:

> *"So not only are we now saying that when you want to write you have got all of this baggage but now you have got to go over there and do it." (Angela, Senior Advisor, Interview, 2011)*

She drew attention to the fact that it was not just about availability of technology that affected utilisation, but the student's perception as well. Sometimes students who might have benefited from the use of some types of digital technologies were deterred because they were either made to look different, or were isolated from friends and peers by being required to move to a different place in the room to use it. This attention to physical position and space alone made it easy for her to comprehend why some students might be reluctant to use some digital devices. It was not necessarily to do with the device itself, but the unnecessary attention that some felt it focused towards themselves and their difficulties. This use drew attention to difference. It could be compounded if supporting staff were indifferent in their outlook as another facilitator also emphasized:

> *"Sometimes prediction is not used because students are reluctant to use anything that is different from their peers; changing this view is made difficult when school staff do not welcome the change either." (Pam, Senior Advisor, Questionnaire, 2011)*

In circumstances like these, context had more to do with behaviours and perceptions within the setting and the way that a concept of inclusion and difference was nurtured, as much as the availability of any technology. Combined positively and with sensitivity, the use of digital technologies held potential for the individual but implemented indelicately, they could also create a barrier to use.

Accessibility in different locations was another important consideration. In a primary school, such as the one that Kate attended, a student's movements were usually confined to one classroom, but in a secondary school, students were generally required to move around the school to different rooms for different subjects with different teachers:

> *"We have pupils who are moving through to secondary. We look at their kit and it is not appropriate to always stick with a big heavy notebook when they have a wheelchair and wobbly mobility." (Paul, LEA Advisor, Interview, 2011)*

In this example, accessibility entailed that both necessary software and hardware needed to be made available anywhere it was required. The potential to use devices that were portable made it easier for some students in secondary schools. One opportunity explored by this advisor had been the use of a netbook computer because it was smaller and lighter than a standard laptop.

However, despite early signs of success, he had found that subsequent changes in later models resulted in changes to keyboards that were not always suitable for use with his students. This emphasized the need for a constant and dynamic approach to the consideration of digital technology use as well as attending to individual need.

The environmental considerations mentioned in this section were just one indication of the depth of knowledge displayed by facilitators, often learned through personal experience or from sharing expertise with others (this is given greater consideration in Chapter 6). Much of this knowledge had been gained from years of working with students with varying needs and advising upon use of a range of digital technologies. Students and facilitators sometimes encountered barriers and difficulties with digital technology use, but also explored viable alternatives and adaptations. Attention was given to the importance of matching technology specifically to the needs of the individual; an essential consideration in whether technologies were suitable for purpose. Technologies changed, were superseded or developed, but access to knowledge about them was fundamental and not necessarily found from knowledge within the school that the student attended.

4.2 Potential Barriers: Provision of Training and Support

Jan had spent time showing Kate how to use some of the functions within her software and later explained that she structured her visits so that some aspect of technology knowledge could be extended just a little more each time, leaving the student time to explore independently before their next meeting. Sometimes a new tool would be introduced or like this time, how to use a specific feature. On this occasion, it was the use of the planning facility and the ability to construct a planning frame for writing support. However, part of Jan's visit did not only involve supporting Kate, she also needed to support and train Ann, Kate's TA. A significant amount of the observed session was spent explaining what she was doing and why. Ann had a gentle and caring nature. She appeared genuinely fond of her charge, but although she was the supporting adult, when it came to using digital technologies, Kate was the one who displayed the greater knowledge and experience. Ann took the role of learner amidst the trio. Kate was reliant upon her TA for physical needs but not for those where her use of digital technologies were concerned.

During the session, Ann created notes on a handwritten page in an attempt to capture the information Jan proffered, but watching the way that Kate efficiently clicked and opened folders on the laptop, I wondered whether she would ever have need to make use of them. Kate seemed quite proficient for the two of them. There were some delays with setting up the program and accessing the school network, which was determined to work at snail's pace that morning, but Kate demonstrated that she knew how to access previously stored files. Jan worked rapidly and Kate appeared to keep up, but I wondered just how much her TA absorbed.

Collaboratively, a template for a narrative text was set up that provided the opportunity to insert bullet points within it for planning generally. Ann had interjected at one point and commented that although she thought it was useful, it was not the type of writing Kate was doing in class and did not think they would be able to make use of the utility. Her reaction was directed, I felt, towards the genre under construction. Ann did not seem to understand that Jan was using this as an illustration of creating a planning outline that could be used generically for any type of writing, not restricted to the example being constructed.

Amidst this discussion between the adults, Kate's knowledge and growing independence for her own needs was displayed. Unobtrusively, she ran her finger over the mouse pad on the laptop and quietly flicked open a file. Politely, but quite firmly, she interrupted their conversation with an emphatic statement that she had already used the function before. She showed an example headed 'Food and Vegetarianism'. "*See I did one,*" she pointed out to them both. Laughter erupted, as we were all made aware that Kate was quite capable of deciding when and if the facility was of benefit. It drew attention to the fact that Ann was the novice in this context, not just with the functions of the program and its application but, as I learned, about using computers generally. Later she readily acknowledged that she had been on a steep learning curve since Kate had started using her laptop regularly, but felt that she was slowly improving. The comment had been made without embarrassment just an expression of honesty and reality. Her statement prompted encouraging comment from both Jan and Kate who acclaimed the extent her knowledge had grown, when only a few months earlier, she had not even known where the space bar or enter key was on the keyboard.

This difference in knowledge between Kate and her TA, highlighted the consideration of competency amidst those who were expected to support students with digital technology use and their own lack of expertise. In this illustration, Jan visited Kate every few weeks and was confident that she would be able to use both the laptop and the software independently. By adding a new task or showing a new function each week she had slowly guided and extended Kate's knowledge. Her TA, however, was not proficient with digital technology use. Although willing to learn so that she could support Kate, she did not use them regularly herself. Jan, therefore, needed to be a facilitator and mentor with Ann, as much as Kate.

There was a good working rapport between them all and Jan's facilitation skills were very much in evidence. Comments were addressed to both of them but it was always evident that Kate was the more proficient and accomplished. Throughout the session, whenever Jan demonstrated a file to open or an icon on a toolbar to use, Ann would look up and try to capture this instruction in textual format upon her page. Those marks with the pencil could be heard in the audio recordings

I captured and the irony of Ann jotting notes by hand as Kate learned to use new tools on her laptop lingered long after the event.

Before focusing a little more upon the role of using TAs to support students' use of technology I need to set this into the broader context of their role and the way they are used in schools. As I have previously drawn attention to (see :38), TAs were used to provide a support mechanism with students with specific needs in schools and support inclusion (Frederickson and Cline, 2009), but the efficacy of their role, their increasing use and particularly the use of inexperienced staff has been questioned (Giangreco, 2010):

> *" There is something paradoxical about the least qualified staff in schools being left to teach the most educationally needy pupils, and there is a concern over whether this provides the most effective form of support for the children in most need." (Frederickson and Cline, 2009:100)*

The use and quality of TA provision and their role with students discussed in this study brought with it many considerations. I have confined myself here to explicit issues that related to their involvement supporting the use of technology with students with specific needs. More general issues raised were beyond the realm of this specific thesis.

Although the role of support provided by some TAs in schools was seen as exemplary, some facilitators expressed their own concerns. Some felt that there was over reliance upon TAs supporting, and being responsible for, digital technology use with students. Some called for far greater knowledge and responsibility to rest with teaching staff themselves. To try to overcome this issue, one facilitator described how his regular visits only ever involved the student and the supporting TA, but he purposely attempted to incorporate greater involvement from teachers by trying to set up significant meetings at particular times of the day. This was sometimes easier in primary schools, where the student had a classroom teacher, but more complicated in secondary schools where the student had contact with different teachers for many subjects. Advisors and facilitators specifically wanted to talk with teaching staff to ensure that full responsibility and accountability was held, but raised their concerns that, sometimes, essential training in the use of a device or software was left entirely to the responsibility of the TA. Some felt this was inadequate and that teachers' professional involvement was vital in order to understand the purpose behind device use and its function. This was important, as consideration needed to involve technology instruction and application, but also pedagogy and student need; implementation was only part of the process. However, majority of visits only took place with students and generally only involved liaison with the TA who provided the link back to the class teacher.

Some advisory professionals also expressed concern about the competency of some of the TAs

they were required to liaise with and their ability to support some students with digital technologies effectively. Ann, Kate's TA, was not an accomplished or even regular computer user, yet she was supportive and willing to learn. In this context, Ann's lack of competency did not seem to be quite so critical as Kate, with Jan's support, was beginning to take greater control and responsibility for her own learning and needs. In other circumstances, however, this was not necessarily so. Some students required greater support and it was particularly critical for those who were dependent upon more complicated technology as exemplified in the following concern:

> *"I know some really severe complex needs situations where the TA has been imported into - that doesn't have the IT capability to make that happen. So when they are being employed, you know certainly for the kind of technologies, they need to know more than the other TA next to them. They need to have a diverse range of skills. They almost need to be advanced skills in some situations" (Paul, LEA Advisor, Interview, 2011)*

Here, the advisor drew attention to the lack of, but need for, advance training skills and knowledge matched to the specific needs of the individual requiring support. This was a factor schools needed to ensure occurred with appropriate allocation of support staff matched to student need but in his experience, this did not always occur. He also expressed consternation with the quality and professionalism of some TAs he had encountered who lacked the necessary skills to support students reliably. He went on to tell me that on every visit he made to one student, he had to show one particular TA the same task involving a flash drive (a basic piece of data storage from which some programs can run):

> *"So I know there are some situations which I will go into and I will show them for ever and a day how to use the flash drive. Every time I do the same thing. I realise that technology is difficult and so I would say to the school is that the right person who should be doing that if they can't do that?" (Paul, LEA Advisor, Interview, 2011)*

In this situation, the flash drive was only one small part of the technology a student required. This advisor's exasperation was felt as he raised concerns about the lack of clear guidelines for the role of TAs and their suitability for the quality of support they needed to provide. His comment was not a personal criticism of TAs themselves, but with the policies and practices of schools and the way that the allocation of provision was managed with insufficient attention to the very specific needs of students. There were clear parallels here with the concerns regarding use of TAs raised earlier.

However, it was not only apprehension regarding the competency of TA support that was expressed, but also the inconsistency of process where the transient nature of their allocation and employment, led to a lack of on-going support for some students. Some facilitators felt that they sometimes spent a great deal of time and effort training specific individuals to support a student, only to find that the role had been short term and the specialised training and information they had received was not passed on:

> *"Most of the kids that I was working with had a teaching, well they were called learning support assistants in those days and most of them had no idea about the technology. So you are spending all your time training up that person to work with the child and then you would go back and find that that person had left or been moved on to somewhere else and so you started again with the next person". (Mary, Retired Advisory Teacher, Interview 2011)*

This lack of process was not only inefficient but also detrimental to the needs of students. The whole topic was complex and involved considerations of pedagogy, school organization, management and responsibility; all issues which were context dependent. It highlighted a lack of support processes within school as well as outside of them. However it also drew attention to the fact that even when students were provided with, and were able to use digital technologies to support their writing activities, the quality of support they sometimes received was dependent upon the quality of the TA's knowledge and experience, not that of their teachers.

4.3 Potential Barriers: Perceptions of Use

Although Kate liked using, and preferred to use, the software on her laptop for textual production, its use for classroom activities was dependent upon her teacher's perceptions and acceptance of its purpose and this extended to the use of text prediction. In my brief observation, Kate did not appear to be totally dependent upon it for the purpose of her activity, but Jan felt that she used it really well and needed it. In fact when Jan specifically asked her how much she felt it helped, Kate was ambivalent. She was far more emphatic (and enthusiastic) about her use of the laptop with the writing program and its provision of different functions. Yet, when you watched her gaze when text prediction was operating, her eyes wavered from the keyboard to the prediction box, so she did not ignore it either.

Kate did not touch-type. She used the keyboard steadily, but not speedily; with some fingers from both hands on the keyboard. In the session, Jan decided to set up the prediction so that the next word was predicted once one or two letters had been entered, whereas in its existing setting it

was constantly suggesting the next word based upon context and syntax. Up until this point, Kate had been quiet and not vocal in any response to a question or invitation to comment. She spoke softly, but suddenly it was as if a switch had been thrown. Her TA had left the room but the moment she returned, Kate animatedly told her that the prediction was about to be changed. It was difficult to know whether she had discovered something more she held control over or whether it had merely caused a distraction in its present form. Regardless, the setting was to be tried and Kate would decide which method of entry worked best for her before Jan's next visit.

The opportunity to observe Kate's use of digital technologies provided an opportunity to witness the confident use she displayed and to sense the rapport between her and the two adults who supported her within a positive and supportive environment. However, the initial proposal to encourage Kate to use the laptop for written tasks, and to make specific use of text prediction had not been greeted quite so enthusiastically by Kate's teacher. Jan had felt that he had failed to grasp the purpose behind this introduction and exploration. She also thought that he had not necessarily fully appreciated the severity and degenerative nature of Kate's condition with its impact upon any expectations demanded of her. However, the longer that Kate was at the school (now in her second year) it was, unfortunately, becoming increasingly apparent. In light of her physical condition, the concerns with forgetting how to use a pen and the use of text prediction as '*cheating*' seemed incongruous.

If these issues were analysed further, Kate could use a pen, so if Kate's teacher perceived that writing required the ability to use a pen then she could demonstrate this, but with compromised production. It was the consideration whether this was the most effective tool to use in the circumstances that was more important. The essential factor was the child herself and a consideration of her needs when her low energy levels and poor muscle tone reduced any output and fatigued her. This, combined with the degenerative nature of her condition, was of far greater significance. The use of text prediction had originally begun as a trial to see if it helped alleviate the effects of some of these issues as well as increase production and efficiency. However, without access to teaching staff, it was frustrating not to be able to explore these issues in greater depth from another viewpoint because, as I listened to the conversations between the three of them that day, it was evident that Kate did not use the laptop consistently either in the classroom or at home, where her mother also acted as an occasional amanuensis for homework activities.

A discussion with Kate ensued, and arrangements were made for her to take the school laptop (with her writing software) home to complete any activity and that at some point in the immediate future, the same software would be put onto her home laptop. To conform to classroom practice, and to adhere to the same presentation as the other students, any text she created would be printed out when she came into school in the morning and glued into her

homework book. The most significant issue to arise, however, was that the purpose of text prediction still did not seem to have been fully understood or accepted by her teacher. When any written production involved some form of classroom assessment, which Kate referred to as 'The Big Write', she had to turn the prediction facility off, even though Jan had originally suggested that leaving it switched off for a few sentences would give an indication of what she could produce without it. It was as if the compensation provided was acceptable for some contexts, but no longer applied in assessment. Kate had to conform to the same practices as the others, despite her physical condition and the increased effort she had to exert to conduct the same task. In this context, the playing field had not been levelled so that the concept of 'sameness' applied to all, because the field was never level to start with. Kate would always need to expend far greater effort to participate in any activity.

Kate's experiences were not unique. Other facilitators mentioned similar issues:

> *"These attitudes can vary enormously from place to place, but the biggest attitude we meet is what I call normalization well everybody else in the class has got to do it that way, so little Johnny can." (Paul, LEA Advisor, Interview, 2011)*

Paul was one of the informants from the facilitator viewpoint whose comments have appeared earlier. In his role as an advisor for digital technology use in schools, he had the opportunity to meet with a number of teachers and visit a variety of settings. He had also worked in the area of inclusion for a number of years and, therefore, like many of the other informants from the position of facilitator, brought a wider perspective in which to embed my research. He emphasized that attitudes towards the use of, what he termed as "*assistive technology*", were not just restricted to the technology itself but also to a wider perception and understanding, or misunderstanding, of disability, impairment, integration and inclusive practice. Paul used the term "*normalization,"* a notion that that there was a fixed norm or expectation that entailed that all students should be treated the same regardless of any individual consideration of difference. One of the issues that advisory staff, like Paul, sometimes found difficult to come to terms with, was that a child might be restricted by physical impairment, but disabled by the attitudes of others. He felt that education and training might help overcome some of the issues, but that it was harder to change some of the entrenched personal, dogmatic attitudes or opinions he encountered.

Attitudes from agents within any context were paramount to the way technologies were perceived and used. Context was important because of the need to understand not only what the technology could do for some users, but the reasons for it being tried or implemented for future needs as well as present. For students with an obvious physical challenge, it was sometimes

easier for facilitators to illustrate that software was worth trialling with the intention of enabling text entry, but this was not necessarily so easy to convey for individuals without an obvious physical impairment. However, informants cited examples where a teacher's attitude could be changed significantly simply by watching a student use specific software and achieve success.

In contrast, the notion of 'cheating' was perhaps more difficult to address without fully understanding what exactly was thought to be compromised.

> *"I have met some resistance - some teachers saying it is making them lazy particularly secondary teachers - interestingly they say - that it is making them lazy and I say to them no, because they are having to build the words themselves to find it." (Paul, LEA Advisor, 2011)*

> *"People see it as "cheating" and that they should be spelling each word. I still maintain that it is a great way to speed up the entry of text." (Gail, Learning Support Service, email conversation, 17.11. 11)*

Both of these responses came from facilitators who connected the perception of cheating with the software's ability to support difficulties with spelling. The first comment emphasised the accuracy of spelling and the second that difficulties with it compromised speed of production. Both facilitators believed that text prediction was useful for some individuals but, significantly, both saw spelling as one of the components of writing ability. Their comments also conveyed the negative reactions to the facility they had encountered, where this type of application had been considered as a compromise, but a positive one that pitched the ability of students against others giving them an unfair advantage. It also emphasized that they had also encountered attitudes towards writing where all should engage in the act in exactly the same way, regardless of individual need or ability.

To conclude this consideration of perception, it was essential that everyone involved with the student understood that digital technologies did not provide an immediate change and were certainly not a 'magic cure'; that there was a learning curve as the student became accustomed to using the technology and there was always the possibility that it might not suit all users. It was essential for those advocating, facilitating or supporting the students' use to make it understood to all parties involved that the use of digital technologies often brought other considerations that complicated use (Selfe and Hilligross, 1994). Again this emphasized the importance of context and consideration of the individual's personal needs and circumstances, not generic application. These were important issues that lay at the heart of technology use. Its consideration contributed to an understanding that some students certainly used some digital technologies for some writing activities for school literacy purposes, but this use was clearly dictated not only by the physical

and environmental context in which they were situated, but also by the perceptions of the agents (teachers, support staff and students) within it.

4.4 Potential Barriers: Technical Issues

During Kate's session with Jan, there had been issues with the network connection that restricted access to an aspect of the activity that required online connectivity (to a remote host where files of previous work were stored). It drew attention to the fact that technical issues were a consideration of any type of digital technology use and another potential barrier affecting utilisation. Sometimes problems were induced, but not always easy to identify as such, by incompatibility with other software installed on the one device. This had been highlighted by Ajay's experience with his attempts to try a new product (see :98) which he had ultimately found to conflict with his switch use. Some students with specific needs required additional devices to access their computer and to use software. Others required a range of software on one device to address all of their needs and tasks. Devices and software, therefore, needed to function together as part of the complete digital process. Discussion with some facilitators highlighted the complexity and specialisation of some of the combinations and configurations of digital technologies that some students with specific needs required. The issue prompted the consideration regarding the availability of technical support for digital technology use but particularly specialist knowledge of implementation and maintenance beyond basic or generic applications.

Some students' productivity was compromised by some school network systems that prevented the use of their specified types of digital technologies. One advisor described problems encountered with virus software and school networks that restricted access, rendering admission to software that required internet connection inaccessible. This contrasted with the perceived rhetoric that the use of networks and virtual learning environments opened up accessibility to software availability rather than just isolating it to individual machines. In the following example, the actual network became the barrier to use as this advisor attempted to encourage and support the use of a specific type of software in her local schools:

> *"Ironically many schools understand the value but are fighting the arrangements for access as many have locked down their systems it is no longer accessible in VLEs or on networks.*
> *Three high schools I work in reset their networks at the end of each week so carefully placed shortcuts for easy access and carefully sorted proxy server barriers to websites like (***) suddenly disappear. The technical*

support in some schools is totally inflexible." (Adele, Learning Support Service Advisor, 2011).

This facilitator no longer faced the barrier of teacher perception restricting implementation of digital technologies because the schools she was involved with had been convinced that specified types of software offered benefits and provided their students with support. The barrier was now proving to be the physical aspects of provision and the impediments imposed by networks and their configuration influenced by technicians, not pedagogy. She emphasized that it was not only technical aspects that restricted access but the maintenance practices of technicians who regularly cleared individual access options for students that had been specifically set up to make use easier. Technical support, and the networks upon which software was run, was a critical aspect concerning use and had a significant impact upon whether digital technologies could be physically used in some schools at all.

The implementation and accessibility of digital technology in a schooled environment was, therefore, not only dependent upon access to agents with the awareness of these types of technologies but also the knowledge to be able to install, run and deal with technical issues when they occurred. Availability and access to this type of support was seen as crucial but, unfortunately, was not always available as another Specialist Teacher indicated:

"Whilst we have plenty of decent hardware our software provision is extremely poor. We buy in our network management from the LA who only seem capable of dealing with standard office stuff." (Chris, Specialist Teacher, Email, 2010)

Some of the digital technologies that some students needed to use were not generic products and when they encountered difficulties, they were in the hands of those who might not have sufficient knowledge or experience of specialist technologies to provide adequate support. If time was restricted, or certain types of software were labour intensive to install or maintain, it might also mean that software required by only one or a few students in a school that might have several hundred students, might not be the most pressing requirement for a technician, even though, for the student, access to it might be crucial, as expressed here:

"Some schools are very good but I would say that majority of them don't place it at a high level and therefore it gets pushed to the back of their job list." (Paul, LEA Advisor, 2011)

Access and levels of support varied from school to school and across LEAs. It was dependent upon any number of factors; such as the extent of a technician's experience, the depth of the school's

monetary budget, as well as priority and the time that could be allocated to attend to issues. Primary schools rarely had a designated technical support team available on site and the level of support available in secondary schools depended upon its size. Schools either accessed support through their own LEA designated team or purchased assistance from outside agencies. Variability and complexity complicated the scene.

In one LEA, the inclusion service provider felt well provided for. He had access to six technicians for the support of specialist software across the whole authority, giving provision for almost 1100 students on its roll. However, at the time of this research, all was about to change under reorganization of provision within it. This entailed the implementation of devolved funding and all responsibility for the students' technologies, including information, procurement, training, funding and support, divested to the student's own school in place of a central body. He expressed his concerns whether schools would cope in the light of such major changes. He felt they would not only be left without access to the service's specialist knowledge and experience, but also access to its technical support team (which was seen as a key issue), potentially leaving vulnerable students without adequate support. His concern was not isolated. Changes in the economic climate had begun to reach across many sectors and LEAs needed to think about the way they offered support for students with specific needs through the services they maintained. Monetary issues, therefore, emerged and impacted upon student support and their access to digital technologies. They are the subject of my final consideration in this chapter as another potential barrier to access and implementation.

4.5 Potential Barriers: Financial Cost

This final section concerns the potential barriers of financial cost affecting the use of digital technologies but needs to be placed into a wider context in order to do so. Some facilitators had indicated a decline in services in some LEAs supporting students with specific needs due to reorganisation and reallocation of budget responsibility. However, it is necessary to remind the reader of the circumstances of the period in which my research took place, because during that time (2009 -2011), the UK was in a period of significant economic downturn. A change in Government earlier in 2010 had initiated a number of economic measures that would impact upon many sectors of society, public funding and social policy, in an attempt to contain economic pressures. It affected service provision in education and, particularly, the field of services for children with educational needs. The Lamb Enquiry (Lamb, 2009) had offered hope of improved opportunities in provision for children with special needs and their families, but the economic climate of the time required austere measures. This resulted in the loss of funding and closure of services that had once been seen as part of the education establishment. An example of this was the closure of BECTA in March 2011 (British Educational Communications and Technology

Association), once seen by some as the voice of the UK's education technology scene and cited as examples of research. Charities that had once supported or offered services for children and adults with specific needs, needed to be restructured or reorganized with their loss of public funding; an example being the threat of closure to the ACE Centre (Oxford), that had provided support for people with communication needs since 1984 (Merlin, 2012). Reform and reorganization of educational services within some local education authorities was also undergoing significant change.

This was in stark contrast to an earlier period when widespread funding of educational technology had seen massive spending in schools on hardware and software in the belief that such funding would result in increased educational attainment (Selwyn, 2011a). This climate of forthcoming austerity was one I entered during my data collection period. It influenced both perception and experience. As a result, this needed to be taken into account as part of the wider context when I considered the comments I have drawn upon from informants regarding reform, uncertainty, loss of services, provision and its potential impact upon the individual. It was also crucial in understanding the potential opportunities for collaboration and extension of knowledge that was critical to considering, understanding and implementing technologies and whether they were ever used.

An inevitable aspect of any investment in digital technologies, therefore, concerned finance, but the issues involved in implementation were not just the cost of software and hardware, but budgets for training, maintenance and technical support. Not surprisingly, responsibility for this cost was an essential consideration. One advisor, trying to encourage schools to buy site licenses for a specific product that had proved beneficial for some students, had found the subsequent cost structure of a yearly license fee a deterrent and although some schools in the authority had initially bought a one-year subscription, were now expressing concern that they would have insufficient funds for the next. Another facilitator described a situation in his school where they had been able to increase student access to digital technologies (laptops) by encouraging students to bring in and use their own privately funded device in school. However, parents had then needed to fund purchase of software that had once been available on school devices. Item by item, this approach was of significantly greater cost to parents collectively than the school's original site license.

Yet another concern was the loss of funding for services through education authorities and the devices that they had once provided or loaned. With the re-organization of services and devolved funding from central sources to the responsibility of individual schools in some education authorities, schools were now expected to fund visits from support agencies for students with specific needs through management of their own budgets. This had evoked concerns that students

who might once have benefited from resources were now at risk of never being given access to, or opportunity to try, technologies as the allocation of funding became tighter and schools no longer drew upon the expertise of such services:

> *"The withdrawal of statements for pupils who have less severe disabilities means that these pupils do not get outside help from agencies such as (name) so they do not get access or a chance to trial supportive software or even use a computer" (Gill, Advisory Service, email, 2012)*

Even when parents sought specialist or private provision of education, access to such resources was not necessarily more readily available:

> *"I certainly don't think it would be at all correct to suppose that specialist provision in any context automatically means that assistive technology is in place and effectively utilized" (John, specialist school, head of department, email, 2011).*

Therefore, although some students were able to use digital technologies to support their writing difficulties, access to them was dependent upon sufficient financial resources to become aware of their existence but also to fund their initial purchase.

5. Summary

This chapter described and examined some of the barriers that have impacted upon awareness and use of digital technologies to support writing within the school context. It focused significantly upon one child's experience in her school but included further illustrations of use drawn from other participants. Key findings identified some use of digital technologies to support the writing process with students experiencing physical and learning needs but found that knowledge about these technologies was not always available from the teaching staff located within the student's own school. When external agents, such as Local Education Authority advisors introduced digital technologies, it was Teaching Assistants (TAs), not teaching staff, who took responsibility for this use with students. Furthermore, some advisory staff felt that there were students situated in schools who did not have access to this type of knowledge or support and who were unlikely to have opportunity to assess whether digital technologies could help them at all.

Even when students used digital technologies to support their writing, some teachers did not always permit the use of specific functions for all types of writing activity within the classroom. This key finding invoked attention to Literacy, as a theoretical concept, and how this was enacted within the classroom environment. Teachers' attitudes towards the role of digital technologies in

learning were instrumental in whether these were ever used at all. Successful use required all agents involved in supporting the student in school (teaching staff, TA and facilitator) understanding the purpose of digital technology use in relation to the student's specific needs. As later chapters will illustrate further, if this did not occur, this impacted upon whether digital technologies were adopted. How Literacy, as a theoretical concept, had been interpreted and enacted influenced this. When Literacy was enacted within an autonomous model and defined with specific skills (such as spelling or legibility), then some teachers viewed digital technologies as completing part of the writing activity for the student and providing an unfair advantage. In contrast, facilitators encouraged the use of technology because they viewed it as a positive contribution to learning. They perceived that digital technologies provided students with support, permitted participation in literacy activity and enabled them to demonstrate what they knew, or could convey in words verbally, but could not produce in text. This latter view involved considering the theoretical interpretation of Literacy further along the continuum towards an ideological model. For some users, like Kate but also other students whose use will be discussed in subsequent chapters, technologies were not merely helpful tools. These students depended upon their availability to demonstrate their true measure of ability.

A further key finding related to the ability to purchase digital technologies for students with specific needs because there was no guarantee that any funding secured through an SEN statement provided finance for this. Yet, a common form of support funded this way was the provision of Teaching Assistants. Responsibility for allocating these funds was left to the student's school and hinged upon their assessment but also their knowledge. The following chapters provide illustration of students who funded their own choice of technologies but, in the examples discussed in this chapter, all technologies were paid from public funding. In Kate's specific illustration of use, the school spent her funding entirely upon TA provision. They had not viewed digital technologies as a primary requirement. It was their decision to provide an old laptop that was no longer required by teaching staff only when it had been suggested by the LEA support teacher that Kate would benefit from using technology.

Disability, as a theoretical concept, therefore could be examined through Kate's illustration of digital technology use and her functioning within her learning environment. There was a lack of understanding of the full impact of her condition. This affected her mobility and strength, but it was the context that defined whether Kate was 'disabled' if it did not permit her to demonstrate her ability and support her needs. Key findings identified that Kate's use of technologies enabled her to participate in writing activity. They helped her to increase her rate of production and demonstrate ability but, essentially, they also enabled her to take part in regular and sustained writing activity; something she was unable to do before their introduction. These key findings were fundamental to any consideration in how Disability was defined. However, if Kate's Literacy

was to develop sufficiently to enable her to cope with the demands for written text as they increased throughout schooling and provide her with greater opportunities for meaningful employment as an adult than those without Literacy, she needed to be able to participate as fully as possible in literacy learning. Without Literacy, Kate would find her ability to exist and function in society restricted.

In the settings explored in this chapter, there were physical barriers that prevented access to digital technologies but facilitators also felt that some teachers viewed the use of technology as an additional tool rather than a vital one. Kate's use of technologies demonstrated that these were essential tools for her. They enabled her to participate in activities that demanded writing. She could also function independently within the learning environment when these were included. In this illustration of use, environmental factors and perceptions of others impacted upon what contributed to any understanding of a theoretical concept of Disability. Kate's use of technologies not only enabled her to demonstrate Literacy but also independence with learning. The essential topics of independent functioning and Literacy will be pursued further in the next chapter as I consider an illustration of use that examines reactions to technologies introduced to support difficulties with Literacy specifically.

Chapter 5: Theme Two: Literacy and Writing

1. Introduction

The previous chapter examined issues of disability or difficulty and how these might be exacerbated by context. The key findings illustrated some of the barriers faced by individuals by the reaction and behaviour of other agents in the learning environment that prevented the inclusion of digital technologies. In this chapter, the focus upon technology use continues by examining the concept of Literacy through the experiences of Steve, an undergraduate. This focuses upon the specific tools he was expected to use and those he subsequently adopted for writing purposes. Steve's story explores his early experiences in formal schooling, the perceptions encountered regarding his difficulties with writing and the reasons that led to his subsequent use of digital technologies. This illustrates how specific technologies have changed an individual's ability to engage in literacy activity but, again, the reaction he faced from the agents within his schooled contexts as he tried to use them. Steve's engagement with digital technologies did not provide a cure for the issues he faced and have required a constant reappraisal of need over time but, as this story unfolds, the reader will begin to understand that the reality of using technology is rarely simple and only one part of a much larger picture.

Steve's experience required careful consideration because his difficulties with Literacy demanded an analysis of the contexts in which this use occurred, as well as an appraisal of the perceptions of literacy behaviour and expectation that agents within these contexts held. Steve's difficulties with exhibiting (what others saw as) a normalized attainment of literacy ability impacted significantly upon his perception of himself and what he envisaged were his own inadequacies. This stemmed from a concept of Literacy that expected specific acquisition at various stages of chronological age, with all students responding to the same methods of teaching. It also examines perceptions of difficulty, repeated failure and its impact upon an individual's perception of self-worth. Steve's experiences illustrate the need to consider environmental factors in contributing to an understanding of individual difficulty. It highlights that perpetuation of historical writing practices and tools used in schooled environments, together with a lack of consideration of emerging ones, have combined to exacerbate writing difficulties for some. It also illustrates that it cannot be assumed that knowledge of developing digital technologies and the ways in which these might support the writing process for some students, is always located within the student's own schooled context.

The data in this chapter was drawn from a series of intermittent email communications that took place over a fourteen-month period. Originally, only Steve and myself were involved in this exchange but at Steve's suggestion, his mother (Annie) was asked to contribute her thoughts and

memories. Conversations with Annie provided the viewpoint of both parent and facilitator and these were added to Steve's, as a user of technology. All of these contributions were assimilated to produce an early version of Steve's story, to which I added some analysis. This was sent to them both for clarification and comment but their response added even further details to the story. All of these email exchanges have culminated in the collaborative story portrayed here that, like the previous chapter, is also set amidst data drawn from other viewpoints to place it into a broader context of use.

2. The Context

Steve was enjoying life as a nineteen-year-old university student when we first began communicating and was the only one out of four significant informants whom I only ever conversed with through online (email) communication. I was aware that Steve spoke the words I received, not entered them through a keyboard. All the text he constructed and produced was achieved through the use of speech recognition software; a digital technology he had used since the age of ten. The construction of his emails suggested an intelligent, eloquent young man who was an experienced user of digital technologies for all aspects of written activity and particularly adept with the use of speech recognition technology. Yet this image of confidence and capability contrasted significantly with the story he and his mother related.

Steve's emails were always chatty, matter of fact and cheerfully composed. He would describe any issues or successes he was having with technology or what had occurred since we had last communicated. Sometimes they contained a sentence or two of casual conversation. The image I held of him as a university student engaged in study only differed because I knew that Steve had only read his first complete book at the age of fifteen and that to cover any reading required for A-levels, his books had been read to him by his parents. Yet, he had still achieved his coveted place at university.

For the language-based subject he studied, he now had to convert any text he was required to read into an audio file. Now, if you have ever listened to an audio book, you will be aware just how time consuming it is to hear one as opposed to reading it. However if you add to these demands, the additional time and effort to convert the texts into audio files yourself, then you may just begin to understand the additional workload required of some students, like Steve, in their efforts to study (Seale et al., 2008). Yet, these were just two of the additional, but necessary, activities that he needed to undertake regularly in contrast to his peers who could just open their books and read.

Up until the age of fifteen, Steve had found reading independently difficult. The time and effort spent trying to decode words led to any sense of comprehension being lost. If he read for too long,

meaning evaporated. So, for the sheer quantity of text that his university course demanded, he listened. The digital technologies that supported his study included scanning equipment and conversion software to turn paper-based texts into audio files, as well as speech recognition software to construct and produce assignments. They were an essential part of his life because even though he had excellent verbal and thinking skills, he could not efficiently type or physically handwrite the texts that were a necessary component of his course.

So how did this young man arrive at university if he could not produce hand written text and had not read a book until he was fifteen? The answer lies in fortitude, perseverance and the incorporation of digital technologies into his life. All of these provided Steve with the means to be independently literate. In addition, he has had the support of loving, resolute parents who were determined to find ways to either overcome or compensate for their son's severe difficulties with literacy. Without these efforts Steve might still be struggling and not at university. However, as the reader will discover, they all needed resilience and determination to overcome the negative attitudes of others; both in the perceptions of what constituted literacy ability in different contexts, but also to negotiate the vagaries and processes of the educational system, in order to access the type of support that would make a huge difference to Steve's life.

To understand this young man and his technology supported literacy life, he and his mother, Annie, took me back to his early school experiences because Steve's story stretches beyond his current digital technology use. It delves into a historical consideration of individual experience because it was important to try to understand how past experience shaped the present. Thus, my focus here considers concepts of literacy, but reach below a surface level of difficulty to see how these were located within a much wider consideration of other influences and experiences within an individual's life. My literature review discussed some of the issues with writing difficulty regarding composition (see :55), but I want to pay attention here not only to physical requirements, but also contextual ones.

3. Steve's Story: Literacy in School

Steve had attended schools that specialized in the support of students with dyslexic difficulties but prior to this more stable period of his educational life, his early school days had been turbulent and unhappy. By the age of nine, he had been, in his mother's words, "*effectively excluded from two other schools"* (Annie, email, 2011). So how had this happened to the articulate young man I had come to know through email communication?

Steve began his school experiences in a state primary at the age of five but after one year had not made any visible progress with learning to read or write. At the school's suggestion, he repeated a

period of schooling and spent an additional term in the first year, but this time with new, younger children. However, this did not seem to make any difference to literacy acquisition. Still unable to read or write, he moved up into Year One, but without any additional, specific literacy support to address his evident difficulties; the gap between his reading and writing ability, compared to that of his classmates, continued to widen until:

> *"It reached crisis point when the Teaching Assistant was making him do "joined up writing", even though he had not mastered the printed alphabet. The teacher told us she was unable to teach him because there were 35 children in the class who needed her attention and were brighter than him. There was no offer of an Assessment and we had no idea of any special needs issues." (Annie, email, 2010)*

With the lack of any constructive support from the school and the teacher's words resounding in their ears, Steve's parents decided to move him to a small private school in the hope that he would thrive in a completely different environment. Unfortunately their hopes were short-lived. At the second school, Steve had access to a Special Needs Teacher; a qualified and accredited dyslexia teacher paid through a private arrangement. She assessed him using the Aston Index test; a battery of tests designed to assess a child's specific strengths and difficulties including language, literacy and motor skills. The results were, according to Annie, interpreted by this teacher as *"bizarre"* and, consequently, ignored.

> *"She didn't even provide a report just told us. We obtained the results later by making a specific request in writing." (Annie, email, 2010)*

Steve's difficulties with literacy persisted. The continued daily demands to handwrite, an expected part of his primary school literacy curriculum, were fraught with failure. Eventually his frustration pervaded into other aspects of his school life, culminating in displays of difficult behaviour. As an adult, he can now explain that not only was handwriting slow and laborious, but he also experienced physical pain when trying to do so. However, it was doubtful that he would have been able to articulate this as a young child and that if he had, how his teachers would have reacted. After all, it was expected that all children in their early years of school learn to write using a pencil or pen.

> *"His minor motor skills were very poor and handwriting was virtually impossible for him. He was writing at below five words per minute, producing illegible work and it was, in fact, physically painful for him. Even before his diagnosis, Steve had done lots of extra writing exercises but to little effect, while being forced to do "joined up" writing made matters worse." (Annie, email, 2010)*

When we discussed this collaboratively, Annie told me:

> *"I think he felt writing was supposed to hurt! He was totally baffled (and so were we) because he was able to grasp/ explain concepts as well if not better than his classmates but was way behind them in expressing himself in writing. He showed little interest in reading himself although he loved being read to. Classic dyslexic difficulties but SpLD*[11] *was not mentioned. Shockingly (to me now!) he did well in SATs even though his difficulties had yet to be diagnosed." (Annie, email, 2011)*

Steve's parents were desperate to find a reason for their son's frustrations and difficulties, so they paid for a private assessment with an educational psychologist who used a range of different tests including the WISC[12]. This assessment "*highlighted Steve's exceptionally high verbal abilities*" but also identified dyspraxic and dyslexic difficulties. Relieved that there were tangible reasons to understand their son's difficulties that would explain his lack of progress, they conveyed their findings to the school. According to Annie, the school refused to discuss the results, but the situation and relationship with staff had deteriorated so far, that a breaking point had been reached. A meeting was convened by the Head Teacher and attended by a number of staff with Steve's parents.

> *"The Head was very defensive and would not discuss the Ed Psych's report at the meeting and refused to accept its conclusions. Thus, she did not accept that any behavioural problems were a result of SpLD not being acknowledged and insisted he was emotionally disturbed." (Annie, email, 2010)*

The meeting culminated in the Head requesting that Steve, now aged eight years, and who in the school's view was "*emotionally disturbed*" was removed from the school immediately. It was felt that his behaviour made it untenable for him to remain. Shocked and upset, but recognizing that the school was unwilling to accommodate their son's needs, an agreement was negotiated whereby Steve was allowed to remain at the school on a part time basis until the end of term. This allowed him opportunity to continue to mix with the other children socially, but he would be taught English and Maths at home.

Yet again Steve's parents found themselves in a position of having to search for alternative schooling. However, they also set in motion the proceedings to obtain a Statement of Special

[11] Specific Learning Difficulties
[12] Wechsler Intelligence Scale for Children – a psychometric test commonly used until recently in the battery of tests for dyslexia. A discrepancy between verbal and performance IQ was considered an indication of dyslexia.

Needs through the state system. As a result, their local LEA initiated a multi-disciplinary assessment and, subsequently, recommended placing Steve in a local school with a unit for students with a physical disability, "*even though none of the professionals involved in the assessment had recommended this type of provision*" (Annie, email, 2010). This proposed school did not provide any specialist teaching for literacy and did not have any experience of children who could not write by hand. A computer suite had recently been installed but did not include any form of digital technology that might support Steve's issues with writing, only some to support the National Curriculum. Steve's parents were dismayed by the recommendation and did not consider this a suitable provision for their son's needs. Their local authority did not agree and so Annie and her husband found it necessary to go to an SEN tribunal to appeal the decision. This was not a trivial matter and resulted in a submission of over five hundred pages of evidence and correspondence, with Steve's parents preparing and presenting their own case, drawing on expertise wherever they could find it. The hearing itself lasted six hours. However, it achieved the result they wanted, the authority was required to fund Steve's provision at a specialist school which Annie described as:

> *"a refreshing antidote to the above. Their approach was, if the child isn't learning, we must be teaching incorrectly and must try a different way. They did not use classroom/teaching assistants". (Annie, email, 2010)*

So, let me pause here and assess what had led to the situation where Steve needed to attend a third school in an attempt to address his parents' concerns with his lack of literacy skills and behavioural issues. Neither of the schools he had attended had helped him acquire the literacy abilities expected of a child of his age; an expectation of both parents and school. By moving to the new school, his parents hoped that Steve would experience the necessary teaching, resources and nurturing environment that had so far eluded his needs. His difficulties had increased with each year he had attended school, and were eventually attributed to severe dyslexia and dyspraxia after an assessment with an educational psychologist. However, whatever the terms used to describe these issues, the events during this period had taken a heavy toll on his self-esteem, resulting in extreme and, what the second school had termed as '*unacceptable behaviour*'. So I need to unpack what exactly had been expected of Steve so far in order to understand what it was that he had apparently failed to achieve, so that it is possible to understand the sentiment of the new school offering '*a refreshing antidote.'*

My first consideration concerns the expectation of literate behaviour. It was expected that the first few years of school provided experiences where children learned to read and write; yet Steve had been unable to achieve either within the educational environments he had attended. His unidentified dyslexia and dyspraxia, a lack of access to any early intervention strategies or specific measures to address his personal difficulties or needs meant that, by the age of nine, he

had not achieved the expectations required of him within the schooled literacy practice and the experiences he had so far encountered. Emphasis of failure was placed squarely upon the personal deficits of the child by both schools without, what appears to be from Steve and Annie's viewpoint, any regard for a consideration of environmental factors. These schools appeared, in the light of lack of any other available evidence, to have exhibited a lack of awareness or attention to any diversity of need, or made any provision for compensatory measures for them.

3.1 Writing: Writing by Hand and Writing Tools

To consider the issues with writing specifically, I have begun by considering the motor mechanics of writing by hand and Steve's view that its execution resulted in physical discomfort. Although some difficulties with writing may be attributed to cognitive functioning (Myhill and Fisher, 2010; Bourke and Adams, 2010), according to Annie and the assessment with the educational psychologist, Steve had good verbal ability. He was able to compose the necessary language required for written construction, but not transform these ideas into text. It was the physical process to produce thought into a recognised, transcribed format of marks (writing in logographic text) for others to understand, which eluded him. Therefore, as other children in Steve's first classroom were entering their journey into the world of schooled literacy and beginning to make their initial marks of meaning onto paper (Kress, 1994), Steve just took the view that the activity required physical pain to participate.

Steve's early difficulties with literacy included both reading and writing but it is necessary to incorporate precision and attention to his specific difficulties with these. The physical process of production involves the mechanics of script production (handwriting) as well as the cognitive process of transcription of thought into text (conveying meaning). Both involve the use of materials and mechanisms (modes) to enact this transformation. Thus a pen or pencil but also a brush, stylus, phone or keyboard could be used to create the symbolic production of a writing system. Our everyday language simply does not possess the vocabulary to attribute writing to differentiate between the physical production and the content, let alone a specific mode (although models such as Flower and Hayes (1981) can help). As an illustration, typing conveys a keyboard, touch typing the ability to type by sense of kinaesthetic memory of key position and not sight, but what is the differential between those that look at keys but type with all fingers or two, those that know their way around the keyboard and those that 'hunt and peck'? Even using the term handwriting might be considered ambiguous, since manual dexterity is required to use any of the aforementioned modes. To attempt accuracy of description, a focus on the early years of schooling places emphasis upon a handwritten script to compose, construct, produce and convey meaning. It requires the use of a system of symbolic representation that children come to recognize as

letters, singly or in combination, to represent a written format (grapheme). Yet even this describes only one part of the complexity of the writing process.

Transcription of text demands mastery of a symbol system (graphemes) matched to speech sounds (phonemes). Therefore, the use of Kress' analogy of writing, as similar to that of learning a new language (see :28), is helpful in attempting to understand the enormity of the task. Yet, this mastery is expected to develop from the early days of school entry and the beginnings of proficiency by the age of seven, at least according to the demands of curriculum assessment (see :48, 56) in both recognition of the symbol system (reading) and its production (writing). Difficulties with writing, therefore, are not only caused by the intricacies of cognitive tasks related to the language system itself, but also the expectation of the coordination of these processes together with the physical manipulation and application of specific tools required for its construction. This involves sufficient fine motor co-ordination and strength in one hand to manufacture or reproduce a replica of each symbol with a specific tool.

Dyslexic difficulties, and for simplicity at this point, I have focused upon one of its manifestations as a difficulty with the manipulation and mapping of a symbol system[13], complicates this further for some individuals. For the child with additional dyspraxic issues, difficulties with sufficient manual dexterity and motor planning to produce these symbols adds further to the complexity. Yet, the curriculum of formalised schooling demands that young children compose text in this manner and acquire this skill at a similar rate, in a linear fashion of acquisition as other children grouped according to chronological age.

Attention to specific tools used for production is also of interest because making marks for meaning by manual inscription extends as far back to prehistoric paintings on cave walls. The pencil itself could be considered a historic writing tool, still resembling the same form of design (Petroski, 1993) and requiring similar application as chalk upon slate, the mode it replaced from the earliest days of massed schooling. As a tool, it needs to be manipulated for the production of meaning. Schools retain this tool as the primary mode for the conveyance of meaning through symbolic representation. The child has to be able to manipulate this tool to convey literacy competence, or at least schooled practice stipulates. Steve's difficulties were exacerbated by such expectations.

Steve's experiences exemplified the complexities of script production for some. It is not a natural activity and has to be taught (National Handwriting Association, 2012), yet this issue is often overlooked (Thorne, 2012). This is given precedence in the early years of schooling as the

[13] See page 52 for a more comprehensive definition

antecedent of the construction of written text. Young children are then expected to write and express their verbal and thinking abilities through the manipulation of this tool, not with digital technology. It is not merely isolated to the early years of schooling since the ability to compose a handwritten text, rather than a technologically mediated one, is a practice that can be observed in classrooms throughout all year levels of schooling. It is where the *habitus* of school practice can be observed as in practices that are embedded historically (Millard, 1997; Marsh, 2006). It was the way that most teachers who teach students today composed text and has been perpetuated into their own practice with others (Belland, 2009).

Despite the availability of digital technologies, the pencil or pen dominates the production of written activity throughout most schooled activity and, in England, high stakes examinations. Some individuals do use digital technologies for exams, but it is not considered usual practice. It is an "*exemption*" or an "*alternative arrangement*" that schools have to apply for on behalf of the student in order to satisfy the requirements of "*Access Arrangements, Reasonable Adjustments and Special Consideration*" (JCQ, 2012) with the appropriate examining board. However, digital exam papers[14] have been available in Scottish secondary schools since 2008 (Mill et al., 2012; Munro, 2008), but only for those who are "*Disabled Candidates and/or those with Additional Support Needs*" (Nisbet, 2012, S.Q.A., 2012). In Scotland this is an evolving situation,[15] but at the time of writing, they have yet to appear in the English examination system other than trials such as the University of Cambridge International Examinations (Exley, 2012). Using a digital technology, with or without text prediction software, at this time of writing, is associated with alternative and accessible practice. Such prominence perpetuates the emphasis and significance of handwritten practices as a mainstream expectation as well as a representation of long established practices (habitus) that exist in educational institutions. Hand written text may be considered to be an important and necessary skill in schooled contexts, but it may not necessarily be everyone's preferred mode for production.

3.2 Writing: Difficulties and Dyspraxia

The need to physically create script (writing) is only one element of the whole complicated process of text creation but it depends upon "*intricate perceptual-sensorimotor combinations*" (Mangen and Velay, 2010). Poorly constructed script may signal a negative perception of ability to some, but this may not necessarily be an accurate representation of either the effort or thinking that has gone into its construction (Augur, 1995; Chivers, 2001; Graves, 1994; Portwood, 1999). Writing by hand can be observed as it occurs but it also remains after completion where it retains

[14] See: www.adapteddigitalexams.org.uk and http://www.sqa.org.uk/sqa/30026.html

[15] At the time of writing this was evolving further in Scotland. See: http://www.callscotland.org.uk

permanence that continues to convey meaning both in the message it contains and in its form. For some children and adults, writing by hand is difficult and for some, as Steve's story will illustrate, remains elusive.

Ott (2007) breaks down the basic skills required to perform the physical act of hand writing script further than those I have already outlined. These are:

- The recognition of individual letter shapes (including upper and lower case, printed and cursive forms)
- Developed gross motor skills so that shoulder, arm, hand and fingers are co-ordinated
- Developed fine motor skills so that the writing implement can be held in a tripod grip (use of thumb, forefinger and middle finger)
- Hand and eye co-ordination
- Kinaesthetic motor memory (automaticity to create letter shapes)
- Spatial awareness (in order to leave gaps between words)

For students with a visible physical impairment, difficulty with the production of a hand-constructed text may be easier for teachers to understand. However, for students like Steve, his 'hidden' difficulties of both dyslexia and dyspraxia, may have been too complex to comprehend without sufficient awareness and understanding of the issues involved. I have defined dyslexia earlier but dyspraxia can be defined as "*an impairment or immaturity of the organisation of movement. Associated with this there may be problems of language, perception and thought*" (Dyspraxia Foundation, undated). It is estimated that it exists within approximately 2-10% of the population, with boys four times more likely than girls to be affected and manifests itself in poor motor co-ordination and planning (ibid). It affects everyday activity, as well as academic achievement, and there is a relatively high correlation between dyslexia, dyspraxia, attention deficit and hyperactivity disorder (ADHD) and occasionally autism (Portwood, 1999). Portwood also draws attention to the fact that although "*observable behaviours*" are evident at a pre-school age, children are generally not referred to outside agencies for help or intervention until they are six or seven years of age (ibid:35), notably after they have attempted to develop writing skills, but not succeeded. Steve's story exemplifies some of these quandaries but it also illustrates his parents' struggle to understand their son's early difficulties when the schools he attended failed to recognise and explain them as well. Steve's frustration produced anguish for them all before his difficulties were fully understood, but not until he was almost nine. His experience highlighted the significance of continued failure and its negative impact upon self-esteem.

Although Steve had spent three years in schooled environments, no one, according to his mother, had ever been able to give any explanation for his difficulties with literacy, nor been able to offer any guidance or provision of a supportive environment for addressing them. He had not received

any additional support, experienced any change in the nature of the literacy program offered or any alternative methods of teaching that took into account any of the specific issues he faced. They did not offer any accommodation for provision or difference in the progression of acquired skills or provision in any of the environments he had encountered thus far. Steve's negative experiences with school, his inability to achieve the demands of literacy expectation and his sense of frustration and failure (Augur, 1998) had a significant impact upon his self-esteem and confidence. He reacted by exhibiting behavioural issues that led to the second school requesting his removal. (However, without knowing the school's version of events, it is impossible to make any objective analysis). Some children with literacy issues, as Steve's story illustrated, react with poor behaviour, others become withdrawn (Ott, 2007).

Steve's difficulties were severe but the extent of these was not known until much later and difficult to tell how much there were exacerbated by the lack of early identification. However, he was not isolated in unhappy and negative early school experiences. Other adults have also revealed publicly their own early dilemmas with literacy and dyslexia,[16] specifically drawing attention to the negative impact these have had upon their schooling and self image at the time (Branson, 2004; Stewart, 2007; Tointon, 2010). More examples can be seen in web pages that have evolved into versions of online support used to share experiences of both success and frustration. Two early versions of these were created and maintained by their young teenage authors with the intent of sharing experience (and uses of technology) with others and displayed similar stories and experiences of negativity and frustration such as Steve's. I originally discovered these pages in the early 2000s and had used them with the young students I worked with who had themselves been struggling with their own self-esteem issues related to literacy difficulties. The fact that these web pages were written by young people for young people not only appealed to them but, at the time, filled a void in the literature appropriate to this particular age range. The following extracts are taken from the sites:

> *"I sometimes felt scared before I went in to school and I sometimes came home crying because I found the work too hard. I hated school but my Mum said that it was not true and that I enjoyed school. By the end of primary 4 I thought I was stupid thick and dumb and I hated my brain." (Kyle)*

[16] See http://www.youtube.com/watch?v=8m1fCz3ohMw&feature=related Kennedy/Marshall Company, 2011

> *"Refused to go to school - my mum took me but I would not get out of the car. The headmaster tried to help but I just lay on the floor until they gave up." (Barnaby)*

On his site, Barnaby[17], one of the webpage creators, also invited responses from other children and young people. Most of the individuals in the early 'Successful Stories' section not only emphasized their early difficulties at school (as the extracts below have prioritized for the relevance of this section), but also their later achievements in life beyond it, their work, qualifications and successes.

> *"I have always found learning hard. i didn't learn to speak properly untill i (sic) was 11 and i couldnt write till i was 12. i was dignosed (sic) with dyslexia when i was quiet young but the schools i went to didn't help me at all. thay (sic) thought dyslexia was another name for being thick." (Emma)*

> *"It was found out that I am dylexic (sic) when I was around 8 years old. I had a hard time at school and found reading a writing a problem. "(David)*

> *"It was when I first started to go to school that people noticed there was something wrong with me, two of my older brothers are dyslexic, so my mother knew what she was dealing with. I used to be carried into school kicking and screaming and then they would shut the gate so I couldn't get back out. That was infants' school, it is a shame but I can't remember much from those years, all I remember is that I hated it, I just can't quite put my finger on what it was that I hated." (Lizi)*

These stories suggest the frustration, anger and loss of self-esteem faced by their authors in their schooled environments. Like Steve, both of the young website designers, adopted the use of digital technologies as a coping strategy to compensate for their literacy issues, and part of their sites was dedicated to their own stories, giving advice and wisdom to other young students.

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17 http://web.archive.org/web/20020403001712/http://www.iamdyslexic.com/pages/fram.htm Barnaby

The importance of environmental context and how this impacts upon positive and negative experience, including an individual's self-belief and esteem, were only part of the analysis of Steve's early experiences. These centred upon the reactions of the first two schools he attended. His early difficulties with learning to read and write were eventually attributed to dyslexia and dyspraxia, but the unrecognized indicators of these, culminated in unhappy early years of early schooling for him and anxiety for his parents. Steve's difficulties with the printed word should have been evident from his first year of his formal schooling, and the fact that they were not, held significance for a lack of awareness, training and perception that, perhaps, did not exist in schools fifteen years ago, at least not in the two he first attended. Another possible reason may have been an inaccurate perception at that time that the specific identification of dyslexia might not have been possible to identify until a child was at least seven years of age. It may well have been that recognition of dyslexia or dyspraxia was beyond both schools' experience or resources at that time, and without access to their insight, it is now impossible to know. However, both schools were aware that he was not progressing along the same literate path as the other children and chose their own different ways to react, none of which involved the use of digital technologies

Parents are often the first to recognize difficulties (Ott, 1997) and early intervention, if addressed, can help to prevent or reduce widening discrepancies in literacy (ibid; Augur 1995, 1998; Stansfield, 2012). Failure to do so may result in potential emotional and behavioural issues as outlined above. Low self esteem fuels these issues and as the child becomes aware of teacher expectation and the gap between his own abilities and that of his peers, secondary emotional or behavioural issues can be ignited by a cycle of repeated failure and frustration (Ott, 2007). Steve's story illustrates a classic example of this scenario. Unfortunately for him, the early warning signs previously identified by the Nursery School he attended, were not heeded. Although they had sent a report to his first school that outlined: "*lack of concentration, avoidance tactics for reading/writing activities*" (Annie, email, 2010), no action had been undertaken in the wake of these indicators. Instead, a '*wait and see*' approach was adopted, and the first school merely encouraged Steve's parents to give him an additional period in the first class with the anticipation that this alone would make a difference.

> *" Intervention is often delayed because legislators in the UK have based their criteria for support for an individual with a 'learning disability' on a 'severe discrepancy between the student's apparent potential for learning and his low level of achievement'. This has failed in what is known as the discrepancy formula, in other words a 'wait and fail' policy. In practice this means that children have to be given the opportunity to learn to read and write before they can be formally assessed as having*

> *difficulties, requiring a document called 'a statement of special needs' ."*
> *(Ott, 2007)*

Early difficulties with literacy do not always culminate in overcoming obstacles, learning to deal with them or achieving success as Steve's story, despite setbacks, will reveal. Another volunteer with an organization working with individuals with literacy issues emphasized that the nature of her work brought her into more contact with negative stories than positive ones. However, she suggested that many of the "*troubled*" adults she had encountered "*traced their difficulties back to school*." She had "*constantly heard stories of children misbehaving or becoming totally introverted*" (Mary, Charity Worker, email, 2011) as a result of poor literacy attainment and their experiences in school.

Portwood (1999) has reported school failure as one of the reasons for the high incidence of learning difficulties amongst the 67 young offenders who took part in her research into difficulties amidst the population within a Youth Custody Centre. She described one of the youths remanded for aggravated burglary after a youth of petty crime:

> *"On transfer to secondary school he found it much easier to disguise his learning difficulties and discovered that insolence and verbal abuse towards teachers and peers achieved the desired outcome. He was removed from the classroom and allowed to spend the rest of the day in a room by himself." (ibid:86)*

Another study undertaken in eight prisons in the North of England estimated that just over half the prison population had "*literacy difficulties which will limit learning and work opportunities*" and 20% with "*some form of hidden disability which will affect and undermine their performance in both education and work settings*"(Dyslexia Institute, 2005). These figures were approximately double that expected outside of the prison system (ibid). Difficulties with literacy, and the way in which they were dealt with, both by the individuals themselves and the contexts in which they found themselves, had the potential to profoundly influence an individual's life (Portwood, 1999).

Portwood (ibid), like others (Ott 1997, 2007; Peer, 2005, Stansfield, 2012), also emphasized the importance of early identification of potential difficulties. Mary (the charity worker mentioned earlier) had observed that parents sometimes cited both Nurseries and Health Visitors indicating warning signs. However, she also suggested anecdotal evidence of some being advised to repeat terms or even a year of schooling for their child, such as Steve had been. These retention practices indicated a higher incidence for boys and those children whose birthday fell towards the latter end of the academic year. This repetition of school periods reflected a phenomenon depicted in

studies from the US where children were delayed from starting school or repeated periods of schooling for reasons that included low academic performance. One study observed that approximately 5% of five year olds were retained for a second year of the Kindergarten program, in the belief that an additional period better prepared them, in terms of giving them time to mature, as well as develop the social and academic demands for school. However, by the end of the First Grade, those children who had repeated this period still had lower grades than those who had not (Malone et al., 2006). A review by Range et al. (2011) considered a number of studies that were equivocal but drew attention to the fact that beliefs and assumptions of teachers should not be the basis upon which such decisions are made.

Neither of the first schools Steve attended, one a private and the other state-funded, had offered differentiated support for any warning signs of potential literacy difficulties or suggested further assessment. Neither did they suggest the use of digital technologies. Seeking an external assessment with an independent psychologist did little to redress the issues with the second school and was just one issue in a chain of events that eventually led to a complete breakdown in relationships. The issue of training for awareness, as well as appropriate teaching responses for literacy issues, was part of Steve's predicament. The avoidance of these types of situations lies at the heart of the premise behind the British Dyslexia Association's present campaign for an awareness component to be added mandatorily to the Initial Teacher Training program in order that teachers are made aware of warning signs, teaching and early intervention strategies (BDA, 2012).

In order to find suitable provision for Steve within an empathetic environment able to teach him literacy skills but with full access to the curriculum, Annie and her husband went through the process of having Steve undertake a statutory assessment to obtain a Statement of Educational Need. This was a detailed and lengthy process that involved a range of professional assessments. It resulted in a formal document that described the student's educational needs and how these were to be best met in terms of resources and placement. The final section also allowed the parents a choice of school, however, it was not guaranteed (Frederickson and Cline, 2009).

The outcome of Steve's assessment was a school recommended by the LEA that his parents considered as totally inappropriate to his needs. Therefore, they engaged upon a process of appeal and instigated a tribunal process. Annie (2011) described this as an *"arduous and emotionally charged event."* A 'successful' outcome was not guaranteed and required persistence. An understanding of the legal process and the ability to professionally represent their case were only some of the skills that Steve's parents required amidst drawing upon their own emotional reserves. This reflects the concern that not all parents have the necessary ability or resources to undertake an engagement with the legal mechanisms of appeal (Shepherd, 2009). In Steve's case,

the appeal was successful and resulted in approval for him to attend the school his parents felt would more appropriately support his needs. They hoped that it would provide a welcoming and understanding environment; one that at nine years of age, he had yet to encounter. It was where he and his parents hoped he might develop the skills of reading and writing that had so far eluded him.

This emerging story illustrates the need to consider the context amidst perceptions of difficulty. In this case, the literacy and environmental context that Steve had experienced in his first two schools contrasted with those encouraged in an inclusive approach to education. Had these schools been more aware of the principles of models, such as those outlined in Dyslexia Friendly Schools initiatives, which illustrate good practice for all children, not just those with dyslexic issues, Steve's early experiences may not have not been so unhappy or traumatic. It is also important to note that during the early period of Steve's schooling, none of the schools he attended made any reference or consideration to the possible use of technology to compensate for Steve's evident issues with handwriting. These were not to emerge until much later and yet again required parental instigation.

4. Digital Technology Considerations

When Steve moved to his third school, it provided the supportive environment and specialist teaching for literacy that his parents desired, but it did not provide the technology support that they were convinced would help. In fact, there were different perceptions of its efficacy and the school did not necessarily agree that using digital technology was the right approach for Steve. However, the school was willing to accommodate parental wishes. Steve was provided with other opportunities to specifically help and address some of his individual issues. These included a specialist dyspraxia teacher who used exercises and specialist methods to re-teach him how to construct the letter symbols and touch-typing classes using a dyslexia friendly method. Neither brought any significant change. Since the touch-typing lessons were not computer based, Steve's parent's decided to try a typing software package to use over the school holidays.

> *"This had limited success as while Steve was able to use the correct fingers, he could not type quickly enough to make it feasible for schoolwork. Further, as he was bright and desperate to learn, he was becoming increasingly frustrated. The effort of trying to write a meaningful amount was extremely stressful, and making him very anxious so we sought medical help. (He was referred to a Consultant Child Psychiatrist and later diagnosed as having catastrophic anxiety). It*

was this awful situation that led us to try VRT[18] as a last resort." (Annie, email, 2011)

By now Steve's frustrations were having a profound effect upon his wellbeing and in order to try to find a way to compensate for his continued struggle with writing, Steve's parents considered and investigated the use of speech recognition software. They were more than satisfied with the ethos and the support the new school offered, but were disappointed that technology was not part of any support strategy. This was an area that both Annie and her husband felt was an important element to consider:

> *"<name of school> was very well informed and kept up-to-date with technological developments for dyslexics. They did not, however, use computers a great deal in the classrooms as their philosophy was to provide sound dyslexic teaching, delivered by specialist teachers. The aim (and they generally succeeded) was to enable their pupils to re-enter mainstream school at 13. This is an approach I endorse and all too often, schools stick the dyslexics in front of a screen to play with *** and claim they are educating them – which they are not. I don't know if there was any shift in this policy after Steve left in 2003 when assistive technology was much improved, and because of his success with it. (Annie. email, 2010)*

Steve's parents were determined to try to find a means to help ease his frustrations and felt that the only way they could only do this would be to find a means that would allow him to demonstrate his intelligence. It was only when they decided to try speech recognition technology, that an avenue was created which, after much perseverance, enabled him to express the thoughts and words that abounded in his head; those that he so desperately wanted to convey, but had so far eluded any methods to transfer them into textual format. Eventually, use of this technology led to the discovery that Steve had a flair for creative writing and would be recognized in his school for his skill with its expression. However, at this stage, I need to pause and consider how the use of speech recognition was brought into the school environment, because it had not emanated from there.

5. Introducing Digital Technologies into School

Steve's parents felt confident that the new school offered a supportive environment and provided access to the appropriate teaching methods their son so desperately needed. However, they were equally aware of the school's lack of technological provision, or vision, which they believed was

[18] Voice Recognition Technology: referred to in this thesis as speech recognition (a digital technology)

necessary if Steve was ever to achieve a means of writing. More than anything they needed to resolve the mental health issues that he had begun to develop. They felt that if this help was not available within the school, then they needed to search beyond it.

Steve's father used computer magazines and the internet in an attempt to locate information. Amidst his search, he discovered a charity that, without expense to them, enabled them to try a speech recognition system. An assistive technology distribution company, which specialized in helping students specifically with dyslexia, also advised that it was essential to learn how to use any system or software themselves before they tried to use it with Steve. So, armed with this advice, and some practical experience of their own behind them, they set out to introduce Steve, then aged ten, how to use the technology. They did this over the period of the school summer holidays. However, it was not without obstacles. The functioning of the early programs (twelve years ago) required extensive training to use. Users needed to be able to read and to speak text into the system to train the software to recognize speech. (Today this is not quite so onerous). When you cannot read the text, this is difficult to do; so to overcome the problem, Annie whispered the words required for the training exercises into Steve's ear for him to repeat into the microphone. The process was arduous but attainable over short bursts of time. They continued to use the software and enforced the good practice that they knew successful use of this system required.

When I queried my difficulty with comprehending the dedication, diligence, energy and motivation required to do this with a ten year old, Annie explained:

> *"The motivation was totally Steve's. Obviously, we did the investigating, bought the software and learnt to use it ourselves, but we would not have pushed him if he had not wanted to go along this path. He was desperate to learn and produce written work that matched the ideas in his head.*
>
> *Steve learnt with ***. The initial training was for twenty minutes and didn't have to be done all in one session, so it was manageable.*
>
> *The training passages were difficult, even those taken from children's books and we struggled with "Charlie and the Chocolate Factory". Accuracy wasn't as good as with current versions but it certainly wasn't bad and when he went back to school, the quality of his work rocketed. Our experience is that with motivated parents, a motivated child can learn; perhaps people only want "easy" nowadays?" (Annie, email, 2011)*

So Steve learned to use the software throughout the summer holidays and returned to school in the autumn term ready to write using his voice. There had been no support provided by the school with the choice or training of the software and, more importantly, nobody actually at the school who could help him to use it on his return. Steve boarded at the school throughout the week "*so he had to be self sufficient*" (Annie, email, 2011) but at the weekends he returned home, where his parents could help. The school, however, still did not agree that the use of this type of technology was the right approach to take, but they still allowed him to use it.

> *"<name of school> felt it was wrong to try VRT for Steve, but their opinion was an informed one. They had been involved in unsuccessful trials for another *** a few years earlier and the Principal had also tried the current version of *** but was not impressed. We disagreed on this point (the only matter we differed on during his five years there) but while they would not train Steve, they did allow him to use it." (Annie, email, 2011)*

Steve was allowed to use the software at school, but not in his classroom. Whenever he wanted to write; he had to move into another room. He recollected this experience:

> *"I was not allowed to use it in the classroom and had to go into another room when I wanted to use it. The school had participated in trials of speech recognition software but this was during a period where speech recognition was too under developed to be accurate so the general opinion was that it wasn't any good. However I did have one teacher who noticed a rapid improvement in my work since using speech recognition. This particular teacher supported me using speech recognition by letting me use his office to work in. (Steve, email, 2010)*

Thus Steve continued to use this software for the remaining years at the school, even though it was never in his classroom. However, he had an ally, the teacher in whose room he worked realised that the software had not only provided Steve with a means to produce text but exhibit his proficient language ability. At last, Steve and his parents felt they had found a way that he could exhibit his verbal ability into written text independently.

> *"The school had a rule that a pupil would only be allowed to use a laptop if they reached a prescribed level of touch typing. Steve never achieved that level. They did however, make an exception. At first, having a separate place to work was good as Steve felt self-conscious as what he was doing generated a lot of interest. The school's staff were generally good at providing a place for him to work. They were also supportive on*

> *using the school infrastructure for printing etc. Unfortunately they had chosen a technology for the school which was not compatible with his software and so he had to do a lot of work-arounds to store and print his work. The teacher in charge of technology later said he was mortified he had designed an infrastructure which did not suit the one person who needed it most; he later changed the school's IT infrastructure so this would never happen again." (Annie, email, 2011)*

At fourteen, Steve moved on to an independent secondary school with a specialist dyslexia unit. It had been selected specifically because the specialist teachers "*claimed a good working knowledge of technology"* and the classroom/subject teachers were "*used to this way of studying"*. Steve's parents were told that there were other students in the school who used technology in the classroom and that Steve would be allowed to use it for both SAT[19] assessments and his GCSE[20] examinations. However, the reality was somewhat different as they found out:

> *"The unit staff, despite having multiple copies of *** in the department, did not know much about it and were not particularly encouraging of its use. As for the rest of the staff, many didn't even know such technology existed." (Steve, email, 2010)*

Despite this lack of awareness and support, Steve persisted in his use of speech recognition, as he had no alternative means of producing written text in any other form. There were further difficulties, which his parents felt arose from a lack of understanding with some members of staff, who did not seem to comprehend the full extent of his difficulties. However, he was allowed to use the software at the back of the classroom where it was perceived he would not cause unnecessary distraction to other students. Once the initial novelty of his approach to textual production had worn off, it became his accepted practice. The software required clear speech, not volume, and did not cause disturbance to others. Although Steve was now able to use it in the same room as his peers, he was unable to use it in all lessons. His Drama teacher, for example, would not permit him to use the laptop in her classes, for fear of it being broken. She could not understand why he could not just write notes like the other students. However, a compromise was eventually reached and Steve was able to use a dictaphone in her lessons which resolved the issue.

Steve continued producing his written work with digital technologies and his newly discovered flair for creative writing was duly recognized and rewarded within the school. He worked hard

[19] Tests taken nationally in UK at the end of the three Key Stages 1-3. The data is collected nationally and published in Performance (League) Tables
[20] General Certificate of Secondary Education exams in specified subjects (UK)

and was determined to secure a place at university. All seemed to be going well with the working practices that had been put into place, that is until the approach of his GCSEs. Then, a new problem surfaced. The school decided that he would not be able to use his speech recognition in the actual exams because:

"It was not allowed by the examining boards!!!!!!!!" (Annie, email, 2011)

Instead, the school suggested allocating the use of a scribe. Steve's parents argued that this was inappropriate, Steve had never used a scribe in the past and it was not his "*usual way of working"*. (This term is used in the JCQ exemptions described earlier in consideration of application for the use of technology). Besides, the school had originally told them, when they had still been contemplating sending him there, that exam boards permitted its use. It had been this positive attitude towards Steve's use of speech recognition software that had influenced their choice of schools. Undeterred, and prepared to seek accurate information, Steve's parents sourced for themselves the relevant sections from the JCQ access documents which clearly stated that a laptop or speech recognition system could be used if it was a student's usual method of working. These were duly sent to the school and a few weeks later they received a letter that outlined approval for the use of speech recognition in Steve's forthcoming exams. The school did not offer any explanation for its change in attitude or offer an apology for its error. Steve sat his GCSE exams and passed.

'Sat his exams,' are three simplistic words to write but the experience was far from it. The exam regulations for JCQ, and as Steve would later learn, for those at university as well, required that all software and data files that were not 'approved' as part of the access arrangements were to be removed for the actual exam. As Annie elaborated:

> *"This is not a trivial exercise as the laptop is also required for revision and would naturally have the revision notes and full year's work on it. Therefore, when he could be revising (!) Steve has to back-up all his course notes to an external drive and delete them from the lap-top. He then has to reinstate them all again after the exam in order to start revising for the next exam." (Annie, email, 2011)*

This illustrates that the use of digital technologies in exams was not simplistic. Steve could use his laptop but it required far more than just written permission. At the beginning of his A[21] level studies, Steve was assessed again by the same Educational Psychologist he had seen when he was younger. This subsequent report included specific recommendations for an additional time allocation of 30% in each exam in order to cater for the additional demands of his slow processing

[21] Advanced Level General Certificate of Education

speed and the need to use his speech recognition properly. Again, the school made adequate provision in that Steve was allocated his own room, personal invigilator, and an amanuensis in case of computer failure and for any tasks that could not be computer generated (the same arrangements that had been in place for his GCSEs). However, despite the fact that the additional time allocation had been recommended by the educational psychologist, it did not happen.

> *"The school refused to support this in their application for access arrangements, namely on the basis that it would not be fair to other dyslexic pupils, even though none of them used SR and were not as severely dyslexic/dyspraxic as Steve. We wrote directly to the exam boards but, at the time, they did not consider requests from parents." (Annie, email, 2011)*

Despite the lack of additional time in the exams, Steve gained his three A levels, and was then ready to take up his coveted place at university.

There were a number of issues here to be discussed, but again I have contained them to those that relate specifically to the contexts of Steve's use of digital technologies, and the need to construct and produce text in the schooled context. Steve received enormous and unrelenting parental support that required time, finance, and physical access to research to discover, explore and support the use of a technology that ultimately, offered the affordance to produce text independently. I have used the term unrelenting support from Steve's parents because they were the ones that found out about the technology, taught and supported him with its use, whereas others may have tried and given up. The use of digital technologies was also initiated by them and not by the school who had initially exhibited negativity. Steve was also determined to display to his teachers what was "*in his head*" but as he later expanded: "*Generally speaking, the attitude from my schools towards SR has been very negative and I've had to persevere and be assertive"* (Steve, email, 2011). Steve came across a lack of understanding towards the severity of his physical problems with writing by hand, typing and issues of fatigue which he found difficult to make others aware were real issues. These difficulties illustrate an example of 'hidden difficulties'. If the problem was not physically visible, then it was difficult for some to comprehend. Steve's drama teacher could not understand this in her concern not to have expensive equipment (his laptop) damaged but a compromise was reached with the use of audio recording.

Character and determination also contributed to this story and Steve's continued use of digital technologies in schooled contexts where they were not always encouraged or accepted. Without the dogged perseveration of the early days, correcting the software exactly as it required, not taking the shortcuts, Steve would not have been successful in its use. (Learning how to use Speech

Recognition software is easier today, with the increased processing ability of technology, but it still requires adherence to the principles that guide its successful functioning). When Steve learned to use this, twelve years ago, it was much more complicated and not so reliable. Yet, none of this advice or support came from either of the two schools in which it was used. In the first school, Annie accepted the lack of knowledge because Steve's dyspraxia and dyslexia was so extreme that the school had never encountered such severity before. However, it was only through Steve's endeavours and positive adoption and utilisation of the technology, the support of a teacher who allowed him to use his room initially and who subsequently realised the affordance that it offered, that the school became aware that it held potential and that their previous unsuccessful attempts with earlier versions had clouded their judgment.

However, the final school Steve attended was specifically selected, because Steve's parents had been led to understand it would offer the contextual environment to support him with his use of technology. This did not eventuate without them having to confront the school to ensure its use, not just in the classroom but in high stakes examinations where it was accepted under an accessibility clause, but which staff remained unaware of. Although the school had been chosen as one they believed would offer good specialist provision, it was not necessarily available. Again, Mary, the charity worker I referred to earlier, had encountered similar reports of lack of awareness in schools regarding examination board regulations. She felt that schools:

> *"create a big mystery around exam access arrangements and are very reluctant to apply for them. They often don't keep up to date and don't seem to realize they are re-issued annually. I have never known a school give a copy to parents – who are frequently amazed to be told they can get a copy/look online." (Mary, Charity Worker, email, 2011)*

My final consideration in this section is about literacy contexts and inclusion, since writing (and literacy) is required in most curriculum subjects. One aspect that was common to Steve's schooled experience, and in the wider context of consideration, was the difficulty of communication and extending awareness regarding provision for individual needs. Annie had felt that a whole school approach, with all subject teachers being aware of Steve's issues, had been lacking. This had occurred in both the specialist school and the one with a good specialist unit. Again, this was echoed by Mary, the charity worker, who felt this lack of awareness of a student's difficulties by all staff was a "*common problem*" (ibid) which was compounded in larger schools. Despite some of his specific difficulties, persistence paid and Steve had been able to use his digital technologies in secondary school to achieve the required grades in A Levels for his place at university. Therefore my final section returns to where I started and considers how these were incorporated into this new academic context.

6. Using Digital Technologies at University

One of Steve's first emails to me stated: *"My experiences at University have been more positive*" (Steve, email, 2011). A similar affirmation came from Annie who felt that: *"technology had come into its own at university"* because Steve *"was now in an environment where lecturers were happy to let him work in his own way, although I suspect they have little understanding of what this involves or the time it takes"* (Annie, email, 2010). He had chosen to study a subject that involved significant reading and writing components. To achieve a similar level of participation as others on his course, he spent significant additional time and effort. At school, Steve's parents had often helped him by reading textbooks aloud but, not surprisingly, he felt that this would be neither practical nor appropriate at university.

To cope with the significant reading requirements of the course, he scanned material onto his computer and used specific software to hear the text read back to him. This method seemed to work, although it was time consuming:

> *"In general, the way I have to work, ie by listening, is much more time consuming than the average person reading". (Steve, email, 2011)*

Note taking in lectures was an issue that he thought he had initially resolved with the use of text prediction. He had discovered this for himself when trying the various functions included in the reading and writing support software purchased through his DSA and had felt it offered an alternative text entry system, when speech recognition was impractical. As one part of his complete literacy support software package Steve had initially found it useful. It learned the specific vocabulary that he required as he wrote:

> *"The more it is used, the better the prediction becomes and the subject specific vocab has built itself up. As I have used the word utilitarian so many times, it suggests it as soon as I hit the u key". (Steve, email, 2010)*

Although training was included as a component of the support package provided by the DSA at his university, Steve had not taken this up because he felt it was too general in nature and would not have gone into the depth of detail he required. He continued to enjoy university life and found his course interesting. However, the dubiety of using speech recognition software in exams surfaced once again when he received a letter from the University Examination Board informing him that he would not be able to use it in his end of year exams. The reason given; it had never been used within the university for examination purposes before. Steve was disheartened, especially as this specific issue had been checked with the Student Disability Service before he accepted his place. The problem was ultimately resolved when another experienced Examinations Officer was approached and helped to inform the Board that if they persisted with their position, they would

likely lose at a Disability Discrimination tribunal. The matter was duly settled and Steve was subsequently provided with good support with practical arrangements for exams. Again the laptop had to be cleared of curriculum material prior to the exam and highlighted the need for a back up laptop (which the DSA does not cover). In his confusion, Steve managed to delete all of his backup files along with the original voice files but, fortunately on this occasion, they could be retrieved with expert help, but it highlighted Steve's total dependence upon his laptop for text creation and that the use of digital technologies was never an easy option or solution.

Towards the end of his second year at university, Steve informed me that text prediction was no longer part of the support strategies he used. Although he had originally used the facility for taking notes in lectures, it was no longer useful. In fact producing text for notes had become an issue and he had to work on strategies to resolve this:

> *"I find it very difficult to concentrate on what a lecturer is saying if I am trying to take notes. This contrasts greatly with my non dyslexic/dyspraxic friends who find writing actually focuses the mind on what is being said. (Steve, email, .2011)*

Instead he had found that good handouts from lecturers worked better, but had also commented that: "*not all academics are good at handouts." (ibid).* When his next exams drew near he realized that he had a problem with little text to refer to for revision which in his own inimitable, humorous style summarized as: *"I didn't have much to read back – it was more like vision than revision."* This called for a total review of his note- taking methods:

> *"Next term, I am intending to tackle the problem by making notes when reading BEFORE the lecture and filling in with what I can remember from the lecture and from the handouts afterwards. As I have to scan in all of the reading material to listen to it, I can cut and paste relevant bits into my template". (ibid)*

He had tried text prediction and although it had seemed to offer a suitable support strategy for a time, it was only a temporary measure. He had been so intent upon actually producing the writing that he either missed content or was unable to record it. The actual notes he had created, therefore, were insufficient for his needs. It seemed that his processing difficulties were interfering with what he needed to do and related to the considerable cognitive demands of writing and the ability to synthesize information at the same time (Price, 2006). Ability to process language at speed required the method of text entry to be automatic, which in his case was not achievable and so valuable working memory was taken up with the transcription process rather than synthesis of information. Steve now had to work out a new method to suit his particular

needs and one that would provide him with sufficient material to use for exam revision in future. It was not that the text prediction did not help him with the mechanics to construct text; Steve's problem was that it just did not help him to make notes. He was, therefore continuing to work out the best strategies for himself. It was the ability to be able to individualize digital technologies to the specific needs of the user together with its flexibility to do this, which led to his successful use.

My analysis for this final section was again co-constructed with the help of Steve and Annie, who elaborated on my original thoughts. Again, I have restricted these to those that relate specifically to the use of digital technology and the literacy context. The first issue relates to Steve's access to the DSA and use of the funds he was allocated. The DSA covered disability related costs that could include resources such as hardware, software, mentoring, training and books. In order to qualify for this allowance a student needed to have documentary evidence that supported the disability (such as an educational psychologist's report) and was then assessed by an independent assessor. The amount received was not fixed but intended to reflect the individual's need. Steve used some of his allowance to purchase an updated version of the software he had been using but he declined training, not necessarily because he felt he was an accomplished user but because he felt that it would not have addressed his specific needs. Studies on students' access and use of technologies when they reach higher education reflect issues that students have to learn to use newly introduced technologies at the same time as they are embarking upon their student career, which may contribute to pressure (Seale et al., 2008). Annie contributed to that sentiment:

> *"DSA is usually the "first encounter" with assistive technology (lots of capable people can't be getting that far) but starting at university, with all the life/learning changes it brings, is not the right time to learn to use a computer in this way". (Annie, email, 2011)*

Steve, however, was in the position where he was already experienced, since he had been using his technologies for a number of years. His meeting with a DSA assessor was positive. He knew exactly what he wanted his technologies to do and what he had already accomplished. Steve found her knowledgeable and able to show him the subtle differences between two packages under consideration and enabled him to make an informed choice. He upgraded his existing package. He generally felt that his use of technology was more widely accepted at university, even though Annie was not so sure that his lecturers were always aware of the additional effort and time that he spent. However, yet again he had met with confusion and lack of knowledge regarding examination access; knowledge that should have been available from his student-support service. Their advice had been inaccurate and had, yet again, required further intervention from a third party to resolve.

Steve also controlled how he spent his DSA. Not only did he know what he wanted, but he had already established working patterns and structure, so he just used his allowance to update his existing equipment by "*tweeking the edges*" (Annie, email, 2010). This was not the enviable position of all students when access to technology support is first encountered at university entry. However what was essential to consider in Steve's situation was his total dependency upon technology. When it broke down, or there was a problem, the funding did not cover an additional back up device:

> *"A problem however is that Steve is unable to work WITHOUT the technology, so when it breaks down he is stuck. This has happened twice. In some cases, despite assurances over 24hr response, he has been days with no technology. The only secure way is to privately fund a back-up laptop and have it at university "just in case" – which is what we do". (Annie, email, 2011)*

My final consideration, therefore, concerns independence. Steve learned to experiment and make his own decisions. This autonomy appeared in his (and Annie's explanatory) emails where Steve conveyed an aura of capability and confidence. It was a final consideration that I put to Annie. After all the years that she and her husband had sought information, supported and encouraged Steve's use of technology, how had they reacted when they needed to step back and let him move forwards into his new life at university. Apart from reinforcing the fact that the only time that they had ever needed to intervene practically was over the use of speech recognition for his exams, she told me that the rest was up to him. So I will conclude Steve's story with her words, as they summarise all of their endeavours and paint a present picture of this young man; no longer the frustrated, unhappy child but a resourceful, determined and independent individual:

> *"We are still very much there when he needs us but he is determined to be in control of his own life. If problems arise, he talks them through with us, we try to help him decide what to do and then he takes the action!"*

'Action' appeared to be an apt term with which to summarise and conclude Steve's exploration and use of digital technologies and on-going commitment.

7. Summary

This chapter focused upon an in-depth exploration of one student's experience with using digital technologies to construct written text. When Steve started school he experienced difficulty with learning to read and write but, later, when he began to use speech recognition technology; this provided him with the means to convey what he could say in words but not create in print. However, Steve's use of technologies met with mixed reception in his educational environments

where Literacy, as a theoretical concept, was constructed and practised within an autonomous model.

Theoretical concepts of both Literacy and Disability assisted in my examination of the difficulties Steve experienced amidst the cultural expectations of literacy learning within his educational settings. Literacy in schools was represented by the ability not only to understand alphabetic text but the ability to construct and produce it with the tools of pencil or pen. Steve found this difficult. However, the teaching staff in these contexts did not understand his difficulties and attributed these to personal deficit. This required detailed examination. In a schooled context the construction of text not only signalled that an individual was capable of behaviours associated with Literacy but was also used across the curriculum to assess learning and ability. Yet, text production not only required learning and applying the alphabetic code but also significant sensory and perceptual ability, including manipulative skills, to enact. Some students, like Steve, found difficulty with this. However, these elements only contributed to one part of the complete process we call writing when models, such as those depicted by Flower and Hayes, are considered. Writing was complex. Yet, within the autonomous model of Literacy constructed in the school environment, the ability to write by hand was expected within a normalised view of Literacy.

Steve's use of speech recognition technology illustrated, as a key finding, that the personalised use of some digital technologies, providing the individual persists in learning how to use these efficiently, can support difficulties with the production of alphabetic text. His use also demonstrated that speech recognition can be used successfully by students of late primary age with adequate initial support and persistence. Steve's parents facilitated this use of technology but it was Steve who persevered with learning to use it by becoming conscious and accountable for his own learning needs.

Steve' specific needs concerned difficulties with motor skills for writing but also about learning to use the alphabetic code. He used digital technologies as a compensatory resource and even though he experienced negativity from some teaching staff when he first tried to use these, his proficiencies with the technologies enabled him to demonstrate his abilities and intellect. Steve could verbalise his thinking. He just could not convey this through alphabetic text. His difficulties, therefore, were not with learning but with the mode that Literacy, as it was practised within his schools, demanded. However, with the use of digital technologies, Steve was able to produce alphabetic text although he needed to be constantly assertive in school contexts to do so. It was only when he finally reached university that he found his use of technologies more widely accepted. This contrasted significantly with his earlier experiences in school.

This chapter, like the previous one, illustrated that digital technologies were used to support writing but this required knowledge and facilitation. However, amidst these key findings was evidence of parents seeking alternative sources of knowledge beyond their child's school. When knowledge and support was not found from the one place they expected to find it, Steve's parents looked elsewhere. They also financed the purchase of digital technologies themselves for Steve to use in school. Parents funding technology provision required further consideration and I will return to this subject in my final chapter because Steve's technologies were privately funded throughout all of his primary and secondary schooling. Yet, like the illustration of use described in the previous chapter, it was important that everyone in the learning context understood why it was felt that they should be used and how Steve benefitted from doing so. This was fundamental since teacher perception impacted upon use and Steve's experience demonstrated that some teachers were found to be resistant to such implementation.

Steve's experience also highlighted the importance not only of facilitation, but also empowerment. His parents sought advice from outside agencies when they felt that adequate knowledge was not available for Steve's needs from within the schooled context. They provided Steve with the necessary support and encouragement; not the staff within the schools he attended. Ultimately, however, it was Steve who took on ownership and responsibility for this use and his parents withdrew their active participation. This prompted attention to issues of personal autonomy and responsibility by thinking about the use of digital technologies in relation to a theoretical concept of Disability. It contributed to my final key finding in this chapter that beyond the early stages of facilitation, successful use of technology requires an individual to constantly analyse and undertake accountability for his own learning needs. Steve's use of technologies emphasized the need for support and not reliance, personal reflection upon learning strategies and continued attention to the evolution of different technologies. Above all, his use demonstrated and emphasized that there was no one-size fits all strategy when using digital technologies. Steve's use of technologies grew from his parents seeking knowledge about them and taking on this responsibility for himself and leads into the focus of my next chapter: the acquisition and distribution of knowledge.

Chapter 6: Theme Three: Sharing and Distributing Knowledge

1. Introduction:

In this chapter I continue my investigation into the use of digital technologies but have focused upon the third theme regarding knowledge. This considers how information about the existence and use of specific types of digital technologies is first discovered and is subsequently distributed and shared with others. I have told the story of Nick, a young secondary aged student with a physical impairment and complex speech needs. Tablet technology (devices which have touchscreens) prompted Nick's interest in digital technologies and led to his exploration of different devices that ultimately transformed his writing practices from dependency upon an amanuensis to independent written activity. Up until this discovery, the genuine affordance of accessibility and portability had remained elusive, but the same mainstream devices that his friends used, not specialist technology, instigated his interest and motivation.

Initially, Nick was influenced by his support teacher's recommendation of digital technologies. However, responsibility for both investigation and management altered as time passed. The balance of distribution of knowledge subsequently shifted to one of shared practice as he became more accomplished. Eventually Nick took control and ownership of his own choice of technology use until, finally, he no longer assumed the role of learner but became a knowledge source in his own right. Together, he and his support teacher have formed a learning partnership that informs the other's practice. This chapter continues the exploration into contexts of use for digital technologies and text prediction, but also the importance of ownership and autonomy in technology consideration and use.

The data on which this chapter is based was drawn from a home visit with Nick and an exchange of a number of intermittent emails. An LEA support teacher, Jan, had invited me to meet some of the students she supported to discuss their use of digital technologies. Nick, like Kate whose experiences were discussed in Chapter 5, was one of her students and his support visit took place in his own home. Over the following fourteen months, Nick and I discussed his on-going use of technologies through the exchange of email and towards the end of the research period, he also helped me to clarify and summarise the understandings I had reached about his use of technologies. This conversation was conducted through Skype (online telephony). The chapter is supported by further data from conversations with Jan and, in a similar vein to the preceding chapters, has been embedded in a much broader consideration from discussions with other facilitators in differing geographical locations and contexts.

2. The Context

> *The ringing tone fades from the speakers on my laptop and the familiar call-connect tone of Skype sounds. The top of a head appears on my screen and just as it begins to come into focus; an adult hand momentarily obscures it. The camera angle shifts and before me is the same young man, albeit a year older. He smiles (or is it a grin?) hesitantly. I wave back and our greetings cross one another as they fly through the ether. We start to communicate – our conversation, facial expressions and body language conducted via internet technology and its speed determined by it. It is not the greatest of connections on this occasion; a delay and an echo disrupt our words and understanding at the most inopportune of moments. A distance of 17 000 km now separates us, but it does not halt the conversation as we pick up from where our last emails left off and we just talk or as Nick emailed the following day: "That was a lovely chat". Our conversations have definitely been chats – absorbing ones." (Diary Entry, 8 May 2012).*

This extract was taken from an entry added to my research diary a day after my final communication with Nick, a secondary aged student and the significant focus of this chapter. It was written after an internet call (Skype) with him and was not my usual succinct synopsis of a conversation, but words that came from my finger tips as I typed my thoughts. That was unusual as I usually wrote by hand if I wanted to review field notes or interviews, but Nick made me think. As a reader you will need to forgive this digression, but there was something about him, his feisty determination and cheery disposition that made me step back and try to look at the world differently, more aware of issues of communities and social acceptances, of inclusion or exclusion. We had decided upon Skype, as opposed to other types of internet telephony, because he could type a word or phrase through its message facility in the event that I failed to understand his meaning. Ideally I would have liked to meet with him again but having moved 17 000 kilometres away, this provided the next best means of communication and in this chapter, communication was an important consideration.

I had first learned about Nick through Jan, the same advisory support teacher who had supported Kate, the focus of Chapter 4. She had wanted him to demonstrate how his use of digital technologies both compensated and supported his literacy activities at school and for social activity. He used tablet technology for communication including writing; digital technology that, at that point in time, was just becoming of interest socially but was only just beginning to creep into schooled contexts. We met at his home rather than at school so that we would have time to

talk. So, one rather dark wintry evening, I found myself on the doorstep of a house; lights streaming through the windows and dogs yelping excitedly from within.

As the door opened, the first members of the family to greet us were Nick's excited dogs, their tails wagging furiously. Amidst them was Nick's mum, a calmer presence amidst the cacophony of canine fervour. She smiled, duly invited us in, and led us through to a large family room. Seated at the head of the dining table sat this young man, Nick, his smart phone, a tablet technology on the table before him and a friend (who later left) by his side. He politely invited us to join them. Nick's mother positioned herself to one side of the table, whilst Jan and I sat on the other. It felt a little awkward at first, sitting around a table that had evidently been recently cleared of the family meal, but it was a convivial environment to be swept into and I could not help but feel welcomed within just a few moments of being seated. Meeting there, instead of at his school, gave Nick time to talk without interruption, other than the usual domestic ones as family members came and went. There was much laughter, chatter and a few serious moments; so much so, that two hours rapidly passed. I was made to feel as if I was visiting with really good friends or family, certainly not conducting an interview in any conventional manner, but then I was not the conductor that evening, Nick was.

Nick had sat at the head of the table, his command of the audience around him. His phone was propped at a slight angle at the end of his outstretched arm on the table. Throughout the evening, he demonstrated the Apps he used and each time his facial expression displayed the concentration he exerted as his fingers hovered and stretched locating keys on the onscreen keyboard. The device sat just in front of his left hand and the heel of his palm was placed firmly on the table, acting like a fulcrum. It seemed to provide sufficient support for the fine movement he required. His hand was able to rock slightly so that either his middle or index finger, the two fingers over which he seemed to exert the most control, adjusted their position sufficiently to touch the keys. Sometimes they wavered, but more like an indecision of movement, but not from any muscle spasm, as they roamed around the keypad seeking and lightly touching each targeted key. The limited width of the onscreen keyboard was small and enabled Nick to keep his hand in one place, steadied sufficiently by the heel of the palm, providing just enough control for those two searching fingers. The effort required was etched onto his face, but the precision he had over the fine movement was quite extraordinary from this young man seated in a wheelchair, his mobility, co-ordination and speech affected by his severe physical impairment (athetoid quadriplegic cerebral palsy).

Nick's Mum sat across from us softly repeating Nick's words for the benefit of my understanding as I learned about his use but more importantly, about him. Jan had been working with Nick for approximately fourteen months by this time and her continued visits ensured that he was able to

use his existing technologies to support his needs and to suggest any new ideas she may have come across in the intervening period. On this occasion she had brought with her a small (wireless) speaker that he was to trial to increase the volume output on either his phone or tablet. Jan had known the family for a number of years, having worked with Nick intensively when he had attended a specialist nursery school, but had not been involved with him again professionally until he was in secondary school. It was her knowledge of his early abilities with literacy and technology at a preschool stage that had attributed to the instigation of change with the way he produced text. At the time of my visit, this had evolved from total dependency upon a TA (Teaching Assistant) as an amanuensis for all written output in all subjects, to the organization and use of technology for as much independent written composition and production as possible. This included the use of his phone as an occasional communication device (AAC) with a text to speech App. However, to understand everything that was shown to me, like Steve's story, it was necessary to consider past practice to understand the present so that I can then concentrate upon Nick's use of Digital Technologies and the aspects of shared and distributed knowledge that is the focus of this chapter.

3. Nick's Story: Literacy in School

As a visiting advisory teacher, Jan had again begun working with Nick when he had been at secondary school for a little over a year and a half. When she had first visited him, she noted that he had settled into school, appeared to be making good progress and was happy amidst friends in a supportive environment that sought to cater for him as an individual. His cognitive ability had been recognized, giving him access to a curriculum that catered for potential. He was stimulated and appeared to thrive on the challenges with which he was presented. However although she had been pleased to see this, Jan was disappointed to learn that Nick's technology skills appeared to have stagnated.

Nick's lack of technology use at this time contrasted significantly from her experiences with him as a young child in the specialist setting he had attended between the ages of three and five. Since the intention was always that Nick would attend mainstream school, he had spent two years in a specialist Nursery unit and had then transferred into a specialist Reception class early (at the same specialist school), in order to give him classroom experience before moving on. Jan had worked with him in the Nursery and remembered him as a bright child who had quickly learned to use a joystick, instead of a mouse, to access software programs and use a keyboard on a sliding mount to create text on the computer. She had worked with him for an hour each day and by the time he was ready to enter his mainstream infant setting, he could create his name and the beginning of very simple sentences on the computer. Her involvement then ceased as he moved into mainstream education.

It was not until Jan took on a new role as an advisory support teacher, a number of years later, that their paths crossed once more. She had been more than surprised to observe that a TA acted as an amanuensis for the composition of any written text. When asked why she thought this had occurred after his early signs of capable technology use in the specialist setting, she could only surmise that a lack of experience and knowledge with both technology and appropriate support methods in his Primary setting had led to its abandonment.

> *"He was a child with very poor speech, a huge physical disability and perhaps they didn't see what his potential was and he stagnated for quite a long time. But they had also been inexperienced with having children like Nick - that needed different thinking.*
> *I think it was easier for the staff. They didn't have the ICT skills that they needed. They weren't used to children like Nick. They perhaps didn't realise his potential. That he could write sentences and make use of ICT. He just didn't move on with ICT." (Jan, Advisory Support Teacher, 2011)*

Jan felt that the primary school Nick had moved into had not been "*used to*" working with students with the severity of Nick's needs. She felt they may have not recognised his potential and only seen the physical persona of a child with a significant physical disability and complex speech issues rather than the bright, inquisitive child within. In her view, he had "*stagnated*" in that environment. However, his later move into a secondary environment had provided a stimulating context where, although Nick could not produce text independently, he could *"keep up verbally"* and was *"challenged*" (Jan, Advisory Support Teacher, 2011). For his part, Nick could remember using the computer occasionally in his previous school, but confirmed that the production of text mainly involved dependency upon an amanuensis. Therefore, when Nick transferred into Secondary school, this practice continued; that is until Jan's appearance into his life again.

Before moving on, it is important to emphasize that Nick's spoken language was difficult to understand if unfamiliar with him and he was reluctant to use a dedicated communication device, an issue that Jan was keen to address. As a result, he always had a TA with him in school, ready to help him for his physical needs but also to speak for him if teaching staff, and there were a number of these in a secondary context, did not understand. These practices had made him totally and utterly dependent upon the constant presence of a TA beyond the capacity of support for physical need.

4. Literacy: Expectations and Aspirations

Jan knew Nick well, with awareness of contexts that included both past and present school practices and, importantly, was experienced with working with students with specific physical

needs, suggesting compensatory measures and particularly those that involved technology. She also had high expectations. Therefore she supported him with his present needs in school, but was also aware of those outside that context and beyond, including encouraging aspirations for university and fruitful employment, the latter being more complex for those with severe disabilities (Koppenhaver et al., 1991; Koppenhaver and Williams, 2010). Jan wanted Nick to develop skills that would encourage independence in his presented situation but, importantly, in preparation for life beyond. She encouraged him to look for technology related support online and was exemplified in an observation as she set Nick a task to solve before her next visit; an activity that she knew he could independently execute, but not without perseverance in order to find a way to store documents in a remote access (cloud technology) that could be accessed from different locations.

A rapport existed between them and this was exemplified throughout the evening. The visit had been relaxed and there was much joking and banter, but there was also respect. Jan was there to offer support to Nick but she was also firm, with high expectations and no intention of just imparting knowledge. She had the expectation that he would explore technical functions and inform himself. The task she had set exemplified this encouragement, not only for exploration of technology use, but also expectation of independent problem solving through the ability to access online forums to seek help and information, just as she did herself. Their relationship with one another was interesting to observe because it did not just highlight different ways to offer support, but epitomized the difference between disabilities reflected by context, not by impairment.

Nick demonstrated his capabilities in his use of devices and revelled in displaying his knowledge. I was the novice lurking in the room. Jan's aspirations for him encouraged him but also supported his abilities. She was determined that objectives for him would remain high so that he would, ultimately, achieve his academic potential. It was epitomized in their camaraderie and her recollection of their re-encounter at his secondary school, an incident she had previously described: *"He realised that he had met his match and that he wasn't going to get away with it any more,"* (Jan, Advisory Support Teacher, 2011). Laughter had erupted as Nick and his Mum recalled the incident and vehemently agreed that both the statement and the sentiment behind it, was certainly true.

4.1 Literacy: Writing Practices

I will just step back a little further at this point to consider the issue I want to focus upon specifically within this chapter; the distribution of shared knowledge and practice, although Nick's use of technologies provoked many considerations. When Nick was in a specialist setting (Nursery and then the Reception class of the Infant school) he had been able to use the digital

technologies there and seemed, from Jan's description of his activities, to be entering a phase of emergent literacy. The focus had been upon preparing him to enter mainstream school. Without access to the schools he attended, it was only Jan's perception, not objectivity that provided any reason why Nick's technologies were only partially used and why a practice of dependency upon the use of a TA to produce his text for him was initially commenced and perpetuated.

In instances like these, where historical context was such an important part of understanding, it was not possible to uncover the whole story and to appraise the subjective interpretation of those recalling the past. Therefore, it was impossible to ascertain reasons why Nick did not continue to develop the earlier proficiencies that Jan felt he had demonstrated with technology during his younger years, into subsequent years of schooling. Jan attributed these to physical and technical issues such as the need for space for a specific type of keyboard, joystick and a designated place for a desktop computer in a busy, overcrowded classroom. It was also the extent of knowledge of technology use and support that existed in the new contexts he had moved onto. He had experienced that with Jan in his previous school, but had there been anyone in the new one with similar or even sufficient knowledge or experience to continue what had begun? The speed and comfort with which Nick could work with the tools that existed at that point in time would also have played a part. The only certainty is that Jan perceived that Nick's digital technology practice from his specialist setting through to the next stage of mainstream schooling would be continued, but this did not occur.

From Nick's perspective, he had been happy to use an amanuensis in his primary years. It was an efficient method for him to convey the thoughts in his head into a material form. The negative aspect the practice encouraged was his dependency upon others. It also brought with it, considerations of literacy development. Using an amanuensis, he was relieved from the technical aspects of writing. So had he been given the opportunity to learn or refine the skills of writing performance? Or, had the opportunities to learn these technical aspects, the same ones expected of his peers, been lost? These were important considerations. Any deficiency would have implications for the future; but a future not only inside immediate school contexts, but beyond it. The ability to produce text was an essential skill for his communication, problem-solving and learning (Erickson et al., 1994; Koppenhaver, 2000; Koppenhaver and Williams, 2010; Smith, 2005) but ultimately his chances of fruitful, future employment (Hamm and Mirenda, 2006). It was only with the re-emergence of Jan to suggest, encourage and support new ways of practice, combined with the availability of a specific type of emerging tablet technology which captured Nick's interest to a technology that he could physically use independently and without compromise, that had changed his practice within school and his continued commitment.

4.2 Literacy: The Use of an Amanuensis

This dependence upon an amanuensis, often provided by TA support, is an important consideration that emerged in other interviews with other facilitators. It held significance for the perpetuation of practice (habitus) as well as dependency upon others for literacy participation and development. It was potentially one reason why Nick's use of digital technologies was not given greater consideration. Another senior advisor also talked about her experience encouraging a student with a physical impairment to try text prediction software on a computer. The initial enthusiasm had soon evaporated as she realised that its implementation required far greater consideration than physical needs. It had also demanded literacy competency:

> *"He was a very, very bright lad who dictated fabulously, who had no hand control but he worked through an amanuensis. He was very good at speaking. He resented any writing for himself because he would rather speak it and someone else 'dealt with all of that' but when we started using it with him, it revealed one thing; spelling ability and he was very aware of that and didn't want to show it and he hated having that shown up. It also annoyed him intensely because he said 'I know what I am going to say, I want to get on with the flow of it I don't want this constant interruption of looking into lists and choosing from it "*
> *(Angela, Senior Advisor, 2011)*

The student, an accomplished user of text prediction on his phone, had become increasingly frustrated with attempts to use it on a computer, and refused to continue with the trial. He, too, had always made use of an amanuensis for written activity. His reluctance highlighted two important issues related to both competency and difficulty. The first was his perception that the use of text prediction slowed his thought processing and the second his inability to spell. Using text prediction had forced this student to change his established literacy practice from that of oral communication to one of text production. The former practice was one in which he was seen as competent and successful, whereas the introduction of text prediction to encourage independent activity, not only slowed his rate of production, but disrupted his flow of ideas.

The second consideration was that text production required spelling. It had drawn attention to an expectation of schooled literacy which this student did not have to consider with oral practice; that an assessment of literacy competence in a schooled environment involved successful spelling acquisition as part of the display of proficiency.

> *"He said 'it just gets in my way' and I think that, for a high functioning - for someone who has got something to write - but then you know as time*

> *went on I said well how about texting on the phone you know there's - but then he acknowledged that there is a different mode of writing and you know what he said 'I am doing quality stuff for you here.'" (ibid)*

By using an amanuensis, this student had been able to concentrate upon the construction of writing and not its production. His usual way of writing was oral construction that necessitated someone else transforming his language into a printed format (production), with no expectation of spelling ability, punctuation or any of the other technical demands of written expression made upon him. With the use of text prediction for writing that needed to be of 'quality,' the student had felt his ability compromised and perceived as less capable, in a literacy sense, than he believed he was.

The use of a TA as an amanuensis was a mechanism put in place by some schools as a support strategy for those experiencing difficulty with written production in order to compensate for a physical or literacy difficulty. However, some facilitators regarded its practice and consistent use with concern. Its implementation provided support but further consideration regarding the nature of that support was also required. As an example, the provision of an amanuensis allowed an individual to concentrate upon content rather than production. The amanuensis may also have provided the technical aspects of written structure such as spelling, punctuation, syntax or structure. In which case, what differentiated the work of the amanuensis and that of the student?

Questions could also be asked whether the practice provided a consideration of support that encouraged autonomy or perpetuated the notion of dependency. In contrast, the use of technology, with consideration to the specific needs of the individual, potentially offered the opportunity to alter this dependence. Nick had, until recently, been dependent upon an amanuensis and I am sure with good intent, of his physical impairment. In contrast, Ajay only made use of a scribe occasionally. Despite his severe physical impairment, for him, it was a last resort. In other contexts, reliance upon the practice had become a learned behaviour and one that was likely to be continued, once begun, as the student moved through the education process. Nick exemplified this practice with its perpetuation all the way through his primary years and well into the early stages of his secondary education.

However, this did not only occur with students with a physical impairment. A similar scenario was described with a dyslexic student by another facilitator:

> *"We have even had teachers asking pupils not to use technology in their classes! (i.e. a Deputy Head of Year 6 with a severely dyslexic pupil who has own laptop with (***) installed. He preferred the learned helplessness model of a TA to read and scribe!" (Adele, email communication, 2012)*

The exasperation this sentiment aroused seeped through her email. It was not that she needed to find suitable digital technology to use with the student, because he already possessed it. Her frustration came from seeing a senior member of staff encouraging dependency and '*learned helplessness*'. It was exacerbated by her disbelief that someone in a position of management within the school was unaware of their lack of consideration for individual need and inclusive practice.

Steve's mother, Ann, a significant contributor to the previous chapter, also believed that independent activity was essential. The opportunity to use digital technologies had enabled Steve to achieve university entry, but this would also support him later in the workplace. Without it, she felt he would have been at risk of some schools' ready prescription of the provision of an amanuensis as a simple provision for present practice rather than lifelong consideration:

> *"The only solution schools offer to children with writing problems is a classroom assistant and you can't have a "nice lady" with you for the rest of your life." (Ann, email, 2011)*

She was not the only one to express the sentiment:

> *"Sadly it is still too easy for students to have virtually all their work scribed. This is fine where it is an agreed strategy to enable them to concentrate fully on the lesson and they control what is written for them. However, too often scribing 'happens anyway' and the pupil just switches off." (Pam, Senior Advisor, questionnaire, 2012)*

The considerations explored here suggest that digital technologies may offer affordance to some students for writing production but also, importantly, may foster independent working practices and avoid the potential pitfalls of dependence upon an amanuensis. However, as this section illustrated, the consideration was full of complexities.

4.3 Literacy: Exploration of Digital Technologies

In order to understand Nick's use of mobile (and highly portable) digital technologies, I return to the early weeks of his and Jan's renewed acquaintance. They involved a journey of exploration to source a technology that Nick was able to use independently. Consideration of access and weight of device had been essential because he needed to move around school for different lessons. So portability was one requirement, but the other was the width of the keyboard because Nick only used one hand. Jan initially tried a netbook with him because its keyboard was not as wide as those on laptops (see comparison in Figure 14).

Figure 14: Comparison of laptop and netbook (right) keyboard sizes

Although the smaller keyboard on the netbook was better for size, it did not meet Nick's individual needs. He experienced a number of mishits on the keys that caused frustration and the device was eventually abandoned. However, it was not until he later started to use tablet technology, that the reason for these problems became evident. It was caused with the position of his hand over the tracker pad on the device itself, not with any difficulty with accessing keys. Nick's stability was obtained by resting the heel of his palm on a surface; in this case it had rested on the tracker pad itself. The pressure had subsequently activated movement of the mouse. However, at the time, neither Nick nor Jan had realised the cause, since a practical strategy would have been to simply disable the pad and attach a joystick. However, Nick had never expressed this difficulty verbally before, which made Jan wonder whether he had actually been aware of it until he had started to explore and make use of the differences afforded with tablet technologies. This emphasized the importance of student consideration and not implementation without due co-constructed, consultation and exploration.

Around the same time as the lack of success with the netbook, Jan also encouraged Nick to try a small hand held tablet device installed with a communication App. The idea behind this was to provide him with a means of communication in the classroom and was an initial attempt to remove the constant presence of the TA by his side and encourage greater autonomy. The speech App on the device made use of text prediction, thus supporting his text entry process by reducing the number of keystrokes required. Later, these types of Apps also provided a useful utility for his composition of short pieces of text but, initially, they were introduced to him as a potential provision for oral communication. In addition, keyboard entry made use of text completion, which contributed to the support of prediction.

This small device aroused Nick's interest in tablet technology and coincided with the imminent release of another type onto the commercial market. However, it is important to emphasize that

at this point in time, tablet technologies were not new, although they had received increasing publicity in the media with a particular device. The fact that it was not a specialist device for impairment or difficulty was another important consideration. This particular device proved to be the catalyst for Nick's interest as, for the very first time, it heralded a technology that he could physically access and use independently for different purposes, in different locations and all from the same portable device. Nick's family took him and bought one on the day of their release.

4.4 Literacy: Emerging Digital Technologies

With the purchase of his first tablet Nick then began investigating its capabilities long before Jan owned one herself. He started to show her what he knew about it and what he could do. The device was light in weight that meant that Nick could hold the device for himself, tucked into the fold of his weaker arm. He preferred it to a computer because it connected to the internet faster, and the keyboard was easier for him to use than the one he had tried on the netbook. The keys on the onscreen keyboard were bigger than the ones on the netbook. They were not raised, did not need pressure and they had small spaces in between. Importantly, there was no touch pad to get in the way of the heel of his palm when he steadied his hand. The control that he displayed was impressive, and allowed him to physically steady his hand sufficiently to use two fingers on the keys. By the time I met him, Nick had refined these movements with practice and the control he exerted over this fine movement contrasted significantly with his gross motor control.

Of course he did not just use the tablet for schoolwork, but also for exploration of the games and entertainment that it provided. Nick could use all the functions such as adjusting the sound, switching between applications, lifting it to change the orientation of the screen; all totally independently. The only negative aspect at the time was the positioning of the board on the table and his seating. When the board was used too close to the edge of the table, the force that he exerted in controlling the pressure in his hand was evident by bruising that appeared on the lower part of his arm. However, he knew that consulting with his physiotherapist would evaluate this particular issue and was subsequently improved by using the device further away from his body, at a slightly raised angle, achieved with the support of a wedge.

Again, I will just pause here briefly to consider some of the events so far, because the emergence of this particular type of tablet technology allowed Nick, amongst the other uses that he now accessed the device for, to take part independently in the specific literacy practice of creating a written text without dependence upon a third party. Although he had remembered using a desktop computer occasionally for some writing activities when younger, the use of an amanuensis had become a quick, easy and accessible means for him to produce written content throughout his primary school years. However, he was now aware that he had been totally dependent upon others. This had not only restricted any independent activity, but had not given

him the opportunity to develop his own abilities with different aspects of the writing process.

Nick had begun his schooled experiences in a specialist setting, where emphasis was both upon the development of his emergent literacy both cognitively and physically. He had been encouraged to use the computer daily and partake in literacy activities upon it. My research had no intention of measuring his literacy ability, but I had observed both his expressive and written language. Orally, Nick's spoken language was excellent. He did not talk in phrases like I had experienced with Ajay's textual speech, and his syntax was accurate. In fact, although I was not always able to understand every word accurately, I thought I could even make out a dialect within his speech composition. He was less productive in our online telephone conversation, but that had been inhibited by the quality of the line as well as our independent conversation without a communication partner. In our email conversations, he composed text using concise but complete sentences:

> *"Hi Cheryl*
> *Sorry I took a couple days to reply.*
> *Yes I have been using the word prediction on the <tablet>for my school work. I find it always works for me. I use a App called ***.*
> *When I'm home I use the <tablet> for games to, at the moment I'm addicted to ****
> *Thanks" (Nick, email, 2011)*

The above email exemplifies the format of our communications and reflects Nick's casual and friendly style. The sentences are precise as he has answered my questions, but he does not (and never did) elaborate extensively upon them. He has always told me what he thought I needed to know succinctly. In this email he clarifies that he still uses a specific App that has text prediction. His emails contrasted significantly with Ajay's, which were usually short phrases and I was never sure how much of that could be attributed to Ajay's communication style for emails, literacy ability or available time. Generally Nick's constructions contained the occasional spelling or grammatical error but I did not know whether his constructions were aided by his technologies of text prediction, grammar and spellchecking. Besides, even the most literate of individuals may use email as a casual style of communication and will make such errors in the haste with which messages are sometimes constructed and sent. My overall consideration was that Nick was able to construct text ably and to use language expressively.

Nick's use of language was not compromised with those who knew him well, as I had witnessed for myself, but was confirmed in conversations with Jan. On the evening of our visit, he had commanded the performance and had been the focus of our attention. There were no issues with any understanding on that occasion. His mother helped to relay his speech (see :101), therefore,

the conversation flowed between the four of us, with Nick prominently at centre-stage. Although she repeated his words, they were softly spoken and unlike the distortion of listening to a translation of an unknown foreign language, I found myself watching and listening entirely to Nick's voice and only paying attention to these words if I was unsure. So for most of the time her voice resonated softly in the background. Nick obviously enjoyed the attention of our visit. His stories flowed and he entertained us. I suspected his participation in the conversation I witnessed was just a usual part of the genial, relaxed atmosphere of his home. That evening, family members came, went or stayed. It was not a case of encouraging Nick to communicate, he just did. This was family life.

This also extended into the style of Nick's written construction and, with the limited amounts I saw through his emails, portrayed competence with sentence structure. Although the use of an amanuensis in his younger years had restricted him to dependence upon others for its production, I wondered whether this focus upon continued expressive vocalization had offered benefits not the negatives of dependency that I had first contemplated. Maybe there was a balance for both. The verbal communication for text production and the modeling of it, may have contributed to this command of written expression he now displayed. Literature suggests that AAC users and those with significant physical impairment are at risk of poor literacy development and that technology, and particularly the developments in technology, have helped individuals to both access and produce text (Smith, 2005). I had no way of contrasting how much Nick's competence with language was the result of his preference for oral communication and its acceptance, rather than placing emphasis upon a communication device with the restrictions it placed upon spontaneity, content and speed. In fact our meeting, internet call and emails had only ever mentioned the use of AAC in relation to the tablet technologies he used. It was only towards the end of my research that I discovered that Nick had a Dynovox (a communication device), when I discovered the word in one line amidst some early notes I had reviewed. When I asked about it in my final clarifications, Nick told me:

> *"Yes I did use the dynovox. I don't use it anymore because my <name of device> can do the same and a lot more. The dynovox was just a keyboard with a 'black and white', little screen. It did predict words like ***" (Nick, email, 2012)*

The words "*was just*" stood out in relation to his dismissal of the dynavox in the light of his phone and tablet's affordance to "*do the same and a lot more.*" On first examination I considered this just exemplified the "*proliferation of inexpensive mobile technology"* that was *"dramatically changing the landscape for individuals with complex communication needs (CNN)*" (AAC-RERC White Paper, 2011). The affordance of control and choice appeared to resonate in his words "*I don't use it any more*", as indeed the emphasis that he now had multiple means of communication, not just

speech, at the end of his fingertips in his tablet devices. However, was it that I, like those outside of the AAC field generally, struggled to really understand what striving for communicative competency is like for those that use AAC (Beukelman, 1991)?

Nick required much more than a specialist speech device for all of his communication needs. The computer, his phone and tablets all used different forms of transcription (which included forms of text prediction) for different types of communication but the Dynavox was limited to speech production alone. Nick was able to use his tablet and his phone as a communication device for both oral (when he chose to) and textual production, as well as a mobile technology for reading, visual communication, accessing the internet, playing games and any of the other myriad of interests that he had discovered and shown me that evening. His devices offered him far greater affordance than just speech and text.

Sellwood (2011) offers an interesting comparison and highlights the consideration of efficiency of choice of device and use. As an AAC user with complex communication needs, he began to use his first mobile phone as a communication device after years of being reluctant to use one. He attributed this to his inability to find one that suited his lifestyle or requirements. His early devices did not allow him to say everything he wanted as well as being bulky to transport and those that did not have text prediction were difficult to use because of his poor literacy skills. "*My frustrations included the fact that my verbal skills far outweighed my written skills and the length of time and energy required to type effective answers frequently meant that the question was long forgotten*" (ibid, Part II, 3.50). Sellwood's comment on his own poor literacy skills draws attention to the issue that the "*educational issues of AAC users are critical*" and that "*support for the necessary skills involved in reading and writing are less than optimal*" (Smith, 2005 :69).

Nick's previous use of an amanuensis for written production therefore needed to be re-analyzed in the light of this new discovery. It was unknown what the previous school's priorities for him had been and why they had relied upon the use of one when textual construction was an expectation in schooled practice. Now I wondered whether the school's lack of experience with digital technologies and working with children with specific needs like Nick, as Jan has suggested, had prevented them helping him develop his own writing ability and independence through technology. Alternatively, maybe it had been positive because Nick could communicate effectively through oral language, so an amanuensis was the most effective and efficient means for him to create meaning at a time when the technology that existed only encumbered him. The focus with his written construction had been upon content and the final product, not independent production. I wondered just what was the greatest importance and maybe that by delaying independent production; this might have been of benefit in the longer term. It made me question my original assumption that the lack of independent production had been restrictive. Maybe there

needed to be a consideration of need here and Edyburn's balance of compensatory resources, as well as the right technology for the specific needs of the individual.

There were also parallels with Steve who could not produce text with his hands but could competently construct it with his voice (see Chapter 5). It was Steve's mastery of speech recognition that had given him the means to produce text for himself. However, Nick's dysarthric speech did not offer him the same affordance to try this type of technology. At first I had also wondered if Nick had missed out on the chance to critically develop his writing skills because it had always been produced for him. Yet, if the ability to talk enhances development as a writer (Myhill, 2009b), the encouragement and expectation that Nick had been given to vocalize had potentially enabled, not restricted, his literacy competence. Since the encumbrance of physical and speech issues puts individuals at risk of poor literacy development, attention has to be given to increasing opportunity for participation at the same time as decreasing barriers that prevent it (Smith, 2005). By providing Nick with an amanuensis, had this been achieved?

In contrast, now with the physical affordance that tablet technologies offered him for production, it was not just the material aspect of the technology that Nick had to learn and master. He also had to develop and refine the linguistic skills of written construction that his peers would have practised (since writing requires practice and time to develop) and refined in preceding years. There were significant expectations being placed upon him. Jan's advocacy supported him with the materiality to access writing development in terms of the creation of a physical visible text, but not to develop and refine the literacy skills needed for its construction. I wondered whether Nick had access to additional literacy support at school for this development and even whether the school had considered that he may have missed critical opportunities in the intervening years, making additional demands upon him now. Therefore, he not only had to learn to use technology to produce text but also how to construct it. Additionally, did those who viewed his constructions in his academic work at school, gave this due consideration in their assessment of his performance or whether it was similar to issues of dyslexia where individuals, even though they have received intervention which allows them to be adequately literate, rarely reach the potential of their verbal ability (Singleton, 2009). Did Nick's present use of the text prediction not only increase his speed of production, but also offer him help with construction? That was something I could not know without watching him actually use his devices.

So, was the lack of demand for Nick to produce written construction when he was younger actually beneficial in the longer term? Could the opportunities that he had been given to develop and command his oral ability, without the concerns of spelling and the other cognitive and physical demands of the writing process actually have been a benefit for him, not a disadvantage as I had first envisaged? Now that he had the maturity of the verbal command of language and a

technology that he could use, he could concentrate upon production. It was an intriguing situation. However, for the present the only evidence I had to hand was that Nick's early encounters with the handheld tablet that Jan had originally introduced him to, had not only ignited his interest in producing text for himself but had afforded him the opportunity to use technology anywhere without the encumbrance of additional paraphernalia of access devices. Now he was using his newly developing skills and interest to produce the written activity demanded of him at school and crucially, independently.

5. Sharing Knowledge

With Nick's continuing and increasing use of tablet technology, the distribution of knowledge and the practice that existed between Nick and Jan took on a new, shared direction. Nick had attributed his initial interest in technologies to his original use of the small tablet, together with the emerging public interest in these new devices that he shared with his friends. It seemed that there were a number of factors about the original device that he had tried, the new tablet that he first bought for himself and the smart phone that he had subsequently purchased when it came out a few months later that were significant. None of the devices were dedicated 'specialist' technologies that only people with impairment used to help them with difficulties they encountered. These existed as social technologies that appealed to a range of users of different ages and interests. They were new, sought after devices, and an interest in their use has not declined and was certainly not contained to educational contexts alone.

For Nick, there were very practical reasons for trying out the tablet beyond the initial media hype that its public emergence initiated. Access to, and usability of, a keyboard interface was an essential consideration because of the challenges he had previously encountered. First of all there was no touch pad to get in the way and this had, and continues to be, one of the main considerations for him [*"because the mouse doesn't get in the way"* (Nick, email, 2012)]. The range of the keyboard could also be reached easily with the fingers Nick used on one hand. He could keep his hand steadied in one position. Unlike the spread of the keys across a keyboard on a conventional laptop, the keyboard on the tablet was concise; with three keyboards multi-layered and could be viewed in two different orientations. Figures 15, 16 and 17 demonstrate the same App in these different orientations and the three layers of keyboard. For Nick this meant that he could keep his hand static and stable, rather than having to move across the wider keyboard, depress a key to create a capital letter with another or other punctuation that keyboards on a laptop or computer require. This improved keyboard accessibility reduced the physical effort required of him.

Figure 15: Speech App showing keyboard

Figure 16: Same speech App in a different orientation and second layer of keyboard

Figure 17: Same speech App with third layer of keyboard

Nick's access to his devices was improved with the angle and distance the device was placed from his body; so access and use from a physiological perspective was an important consideration. This was in addition to the functions of the device that the activity gave affordance to. Anti-slip matting also helped to prevent the device from moving if necessary.

The keyboards in different Apps were another issue. Nick found some more useful and easier to use than others. He did not find the keypad that came with the smartphone and the tablet quite so comfortable to use initially as the one he sometimes used in one of the speech Apps. The one he preferred had just a little more space between the keys to allow for a slight error in placement of his finger and the movement or tremor of his hand. He also did not need to exert as much pressure on a key as he would on a conventional keyboard. Importantly, there was no need for a mouse or substitute. On the device he could just move around the screen with a tap or the brush of a finger.

The design of the keyboard on the phone and tablet enhanced Nick's proficiency with the multi layers, but also enabled Nick, with its own features of text prediction, by suggesting and auto-completing words. If it suggested a word Nick wanted, he could just press the space bar to accept it. Since it learned as he typed, the prediction held the potential to improve with greater use. Jan suggested that the keyboard could cope with any inaccuracy of finger placement, but another feature was the software behind the keyboard that helped improve accuracy. Although the size of the keys remained the same to the eye, behind the interface they changed based upon probability:

> *"Although you don't see it with your eyes, the size of the keys on the <name of device> keyboard are changing all the time. That is, the software enlarges the 'landing area' of certain keys based on probability.*
>
> *For example, supposed you type 'tim'. The *** knows that no word begins 'timw' or 'timr' and so, invisibly, it enlarges the 'landing area' of the 'e' key, which greatly diminishes your chances of making a typing error"* (www.my-iphone.com*)*

The devices provided Nick with a newfound freedom. He had ever-ready accessibility, as they were easy to carry around, started up and turned off quickly. There was no need to wait to start up and shut down, plus the battery life was good. The existence of these digital technologies gave him independence in both an academic and social context. He seemed to relish in the independence and freedom it gave him to immediately search for information on Apps for specific purposes or those that had been recommended to him by friends. He was mature and thoughtful in his considerations and used gift tokens given to him as presents for App purchases. On the evening of my visit, I had been previously warned that my recently bought smart phone, which I

was only just beginning to find my way around, would be assessed for useful utilities. It was, and I failed to provide any valued contribution. I was on a steep learning curve at that point in time with both Nick and Jan way ahead of me.

5.1 Extending Boundaries

With a device that offered the physical access to a keyboard that Nick could use, word processing Apps were explored. He used an initial discovery at first, but when Jan bought her own tablet she found another that seemed easier to use and which he adopted. This ability to access Apps and download them immediately from and onto the device aided his accessibility and often the same Apps could often be used on both devices. He was independent because he could download what he wanted immediately, so there was no need for him to have to wait for someone to buy a product and then install it for him. The store, with internet access, was at the end of his fingertips at any time of the day and in any location. From within specific Apps he emailed written work back to himself and later learned to upload it into a cloud storage facility (the task that Jan set him on that very first evening we met). He could then access the same document across devices, from wherever he was. All of these were important factors that gave Nick significant accessibility options and extended his flexibility to write in different physical locations without encumbrance. They provided him with a new type of independence and most importantly, ownership and control of his own learning experiences.

Initially Nick and Jan had tried different types of text to speech software on the phone to explore as a means of setting up a communication device for those times that Nick chose to use one. Initially there were two that he seemed to like. One, he was able to use on his phone and it had predictive text on it. The second was used whenever he needed assistance in the classroom, although he moved onto a third later, which provided predictive text and a different design of screen layout. There were two purposes behind the thinking for using the technology for this purpose. Nick used the App to talk to his TA in the classroom when he needed to keep his voice low, something he found difficult to control. In the continued attempt to reduce the need for a TA to be ever present, the small speaker (the one that Jan showed him on the evening of my visit) could be carried by the TA and used to alert his attention when he was elsewhere (provided he was within range of the Bluetooth connection). It also allowed Nick to contribute to class discussions, but they both felt this was not viable given that immediacy of speech was required for classroom discourse. However, for both written composition, production and as a speech device, the use of both text prediction and word completion facilities were available and Nick felt they helped increase his rate of productivity.

Initially, Nick took his own tablet into school but eventually one was provided from the school's funding. However, this raised new issues because there were basic concepts and understandings

of use required. Even though Nick had been using his own tablet for the best part of a year there, relevant staff at the school had not realised that he needed internet access in order to email or print his work. Even the practicalities of the wedge to support its angle to allow his physical access were not realised without Nick pointing it out. When Jan visited a month after its purchase, Nick was still waiting for these. The school network restricted Nick's access to the full use of his technology, but so did the context. There had been no understanding that access was not just about provision of a device. Some basic programs had been added, but not the ones he specifically used, such as those with text prediction for communication. Nick eventually resolved these problems for himself. He contacted the relevant staff and technicians at school, sought their help to address the issues and did not need, or want, Jan to initiate those for him.

At the time of my visit, many of these issues had still not been resolved, so it was not really ready for him to use in the same way that he had been using his own. Jan did not intervene but monitored the situation. She allowed him space to exert autonomy and to use his own initiative. After a few weeks, everything was up and running. Six months later, he seemed to have developed a system that was working for him:

> *"Nothings changed with my Apps for my work but I use *** for word prediction then I can copy it into use *** or use *** .*
>
> *I do still have a scribe but I'm doing more on the <tablet) myself now."(Nick, Email, 2011)*

He was aware that he was writing more for himself and it was of interest to note that he used the App not only to talk to his TAs "*but also I can do my work as well because it has predictive text",* whereas two months earlier he had written: *"Predictive type does help speed me up a bit but I think I'm ok on* use <product name> *and* use <product name>*."* (Nick, email, 2011). However, this was only for short pieces of text, for those that were more substantial:

> *"For my h/w I tend to use my <device> because its easier to print. I would use my <laptop> if I had to write a lot because I still find it easier to write on it." (ibid)*

The situation was fluid. Each email brought subtle changes in practice. He was obviously learning not only about the technologies but also about how he liked to work and what he needed. Again these echoed similarities with Steve from the chapter before, as he took greater control over his own learning space and the nature of the technologies themselves. Now he had moved onto using a new device because one of the difficulties he encountered was the problem with trying to print from his tablet because there was no easy way to do so. When that situation was resolved, a few

months later, he went back to using his tablet. It was a constantly changing and evolving scene that could only be captured over time.

During the latter period of our emails, I learned that Nick had purchased a newer edition of the tablet when it was released. He still used the older version the school had purchased in school, but he was not too concerned with the difference. It still had the same functions to deal with the Apps he used on a daily basis and was not causing any particular issues at that moment in time. He was writing a lot of his own work using three specific Apps in school and he was about to use his tablet in his upcoming GCSE's with a double time allowance. What was curious was why he was now intending to produce text on his tablet and then the TA was going to write on the exam paper. There was always something new to discover.

5.2 Distributing Practice and Knowledge

The distribution of knowledge had already shifted between Jan and Nick by the time I met with them both at Nick's house and the original introductory emails with Jan two months earlier. Originally she had been the one driving technology forward by encouraging Nick to try out the netbook in an attempt to find a means to provide accessibility. The shift in balance that I noted in our encounter and the subsequent emails with Nick centred upon two aspects. The first was Nick's interest. The small hand held tablet that Jan had let him try had prompted his interest in technology. The second was the time period. It saw the emergence of a range in tablet technologies that have continued to fuel his interest and have impacted upon his independent exploration, not dependence. (It seemed that whenever I communicated with Nick, he had bought another in the range or updated a previous model).

Once Nick begun to use his first purchase, he was the one who experimented with its potential in his own time. He accessed the online market place and could discover information about emerging products as well as purchase Apps for his own requirements. This shifted the balance between them both and they started to share information within the shared learning space they had created. Nick's use and early exploration informed them both and he could access further information from online, which Jan had gently encouraged by setting him challenges that initiated exploration in online forums. This online world held the potential for learning and entry into new learning spaces that they both could access.

Mobility issues did not restrict entrance but neither did role. Anyone could learn and contribute. This gave Nick autonomy and control. He was not reduced to only using a product that someone else had bought and had judged to be beneficial for him. He held tangible power over his own needs. Another important factor was the device and the Apps themselves. These technologies Nick used were mainstream; they were not specifically designed devices or software designed as

specialist technologies for the impaired. Anyone could use them and did. They had appeal, they were mainstream and they had aesthetics in their design. They were not, as another informant commented, a *"chunky"* device; a description of the AAC device she had described another student using. Therefore another learning space was the one he shared with his friends who also possessed similar devices and discussed the Apps they used upon them for both educational and recreational use.

Earlier I noted that Nick informed Jan's practice. This was evident in the way she considered the technologies she discussed with Nick for potential use with other students. It occurred in her conversation with Kate's TA (encountered in Chapter 4) when they discussed future schooling and technologies for Kate and it was in her comments as she explored Nick's use with me. It was not about extolling the virtues of new technologies or positives of technology use, but the considerations that were needed to make them viable, not just physically but also contextually and fiscally. It demanded a consideration of each student's individual needs but also the contexts in which they were situated; the people within these, their capabilities and the literacy practices they operated. Considerations such as would a device work in a particular setting, would there be sufficient support and could the student manage independently between visits if needed? Initially Jan had guided Nick. She was his mentor, facilitator and supporter with technology practice, but Nick's introduction to, and his reception of, the tablet technologies had not only shifted the balance from his position as learner, the receptacle of knowledge and practice, but to one where he shared new knowledge he had discovered with her. Jan described their relationship as "*a partnership*," (Jan, Interview, 2011) not student and teacher. I considered this statement further with Nick a year later and suggested to him that sometimes he led the frontier with acquisition and new knowledge; he had agreed that it was sometimes the case but was insistent that there was a balance as he still learned from Jan too.

So the way that these two had created a learning space to share information was of particular interest. It highlighted that knowledge was not merely a matter of instruction from teacher to learner or expert to novice, but acquired through participation in a social context (space) where new knowledge could be shared and developed through joint participation. It was an apt example of the concept of Communities of Practice where people who not only share a passion interact with one another as they explore and learn together, but share and build knowledge not merely distribute it (Lave and Wenger, 1991). Communities of Practice have specific characteristics that distinguish them from just an interest or geographical group, because members share much more than just being interested in something. Jan and Nick shared a focus which was more than just an interest, they also supported one another in their search for knowledge. These communities did not have to exist in a physical location but could exist within an online space as they do in my own professional life, where they are an essential component of keeping up to date with the rapidly

changing fields of technology devices and practice across countries at what seems like an exponential growth.

So how would a community like this relate to the events between Nick and Jan? I suggest that they both participate in their own Communities of Practice quite separately from one another which has driven them both forward with their own knowledge of digital technologies and particularly the use of tablet technology; Jan with her professional work and Nick with his friends and their interest and participation in tablet and evolving technologies. However, they have also created one of their own between them. Within this they have created new knowledge and learned from one another's experience and which, for a period of time, they allowed me to step into as an observer, not a practitioner. Nick may have been a student at school but when I met him he was no longer a student or an apprentice in this active context, but an able pursuer and distributor of knowledge in his own right.

Table 9 illustrates those features that Nick and Jan share in the three characteristics of Domain, Community and Practice that represent the distinctive features of a Community of Practice.

Table 9: Nick and Jan's Shared Characteristics of Communities of Practice

Characteristics of a Community of Practice (Wenger, 1991)	**Key Features**	**Jan and Nick's Community**
The Domain	Shared: identity, participation, commitment and collective competence	• School use • Out of school use • Experimenting • Pushing boundaries of competence • Pursuit of new knowledge
The Community	Joint activities and discussions Self supporting Relationship between members Learn form one another Can work independently	• Meet (face to face) twice a term • Email –online interaction in between • Professional relationship – facilitator and student • Community Relationship – partnership in learning • Share knowledge
The Practice	Practitioners Share experiences, artefacts and praxis Interact over time (sustained)	• Continued learning • Knowledge distributors • Share knowledge with each other and beyond • Experiment • Maintain contact – official (school) and as a result of practice

Jan and Nick were brought together into the Domain because of Jan's professional role, so the school practice they shared was induced but they were both interested in technology use as an out of school practice as well. The tablet was not a technology that was specialist, but used across the wider community; something that they both found of interest but also practised. They shared the Domain by exploring and pushing their own boundaries of competence that they then shared with one another. At present their Community only consists of the two of them. They meet regularly, face-to-face, because of Jan's advisory role but they also continue to communicate online in intermediary periods. They each began with a role assigned to them; Jan a professional role of facilitator and Nick as a student, but their relationship in the context of digital technology exploration and use became a partnership within the community they had created and one in which they were equals. Originally Nick was the Apprentice, but his rapid acquisition of knowledge and participation soon changed the balance in their relationship. Within the Practice they were both learners and distributors of knowledge between one another but they then shared this beyond with others. Jan shared within her professional role. Nick has shared his with his friends and staff in school such as his TAs and technicians, in order to set up and use his own technology within it. They have both also shared with me and so it represents a model of both community and shared knowledge, a potential model for wider consideration of technology support but perhaps most importantly of all an illustration of context where there is no disability, only ability.

6. Summary

This chapter focused upon the theme concerning the discovery of knowledge about digital technologies and distributing this knowledge further. It was illustrated by Nick's personal exploration and use of technologies and I drew upon the theoretical concepts of both Disability and Literacy to explore and analyse its key findings. This began with the discovery of an accepted practice in the classroom: the use of an amanuensis to address some students' difficulties associated with writing difficulty. My research found that when this practice was adopted without considering other or additional models of support or compensation, the constant use of an amanuensis fostered and nurtured dependency upon others for written activity. It did not encourage nor engender independent functioning within the classroom. Nick's use of an amanuensis within his mainstream secondary setting enabled him to participate with classroom activities and communicate with all staff, but it had led to the almost constant presence of a TA beside him. Any theoretical concept of Disability in this context focused upon personal deficit by fostering Nick's dependency upon others for writing and restricting independent functioning within the learning environment.

Yet, under an enlightened, fluid and evolving concept of Disability, Nick's abilities to communicate and participate were not impeded by any personal deficit but by the barriers of his learning

environment and the agents within it who constantly interpreted his needs for him. Until Jan had reappeared to support and explore digital technologies with him, Nick had not been encouraged to seek ways to function independently in the classroom and, even more importantly, his long-term Literacy needs were not being fostered. Yet, these skills were vital if he was to ever have any future prospect of continuing education and gaining meaningful employment. Digital technologies to support written production existed, but they had not been fully explored within his learning context. Instead, it had simply become accepted practice that an amanuensis offered sufficient support and compensation; thus fulfilling any requirements of inclusion in the learning environment.

Earlier chapters demonstrated that selective use of some digital technologies offered some individuals the opportunity to produce written text independently. In this chapter, Nick's experiences and explorations extended this key finding further by showing evidence of emerging mainstream mobile and tablet technologies contributing to a growing pool of potential devices and facilities for consideration. These mobile tablet technologies, with on-screen keyboards and touch screens, offered Nick alternatives from the heavier and less mobile, specialised technology he had tried before. They appealed because he could enter text through an accessible, on-screen keyboard (rather than a mouse or touch-pad). This motivated him to write for himself and not depend upon an amanuensis. The devices were portable so he could access writing tools whenever or wherever he needed but, significantly, the choice was his because these were privately financed. Nick, therefore, could select a device based on the features that *he* felt were suitable for his own specific needs rather than someone else deciding for him. Nick was no longer restricted to the specialist or assistive tools purchased for him on the basis of a professional's assessment of his needs. With his support teacher available to facilitate use if necessary, Nick not only began to use digital technologies for writing purposes but to explore how these might support his communication needs. The concept of Universal Design was evident amidst these mainstream technologies and contributed towards making a device appealing and productive, thus motivating Nick's interest in further exploration.

After years of dependency upon an amanuensis, Nick was now writing for himself. Yet it was his early use of other devices that led to my next key finding and centred upon the importance of knowledge and facilitation. In order for individuals to explore any potential affordance of digital technology use, it is fundamental that they not only have access to a reliable knowledge source, but one that is able to facilitate use in the early stages. Nick's early explorations were encouraged and supported by Jan. Through her, he had an informed source of knowledge and facilitation just as Steve (in the previous chapter) had experienced with his parents support. Yet Nick's use again draws attention to the fact that this was drawn from an external source because it was not available from within his own school.

Access to an informed and reliable source of knowledge regarding the use of digital technologies to support those with specific needs, including ways in which this could be accessed and distributed, was essential for users. Nick's experience demonstrated a journey of discovery in relation to the use of technology and learning needs, the affordances they offered and the tribulations of use. His adoption of technologies did not emerge from just one visit with someone who suggested a device; but took place over time. This was an important issue to consider for any service that provided student support. Knowledge was not merely imparted but acquired through on-going social interaction regarding use.

Therefore my final key finding reflects this observation and found that successful facilitation involves early initiation and support but also the implementation of strategies that encourage the individual to consider and contribute to the decisions in what is used and how this is evaluated. This model leads to greater opportunity for autonomy, ownership regarding the choice of digital technology used but, most importantly, responsibility and accountability for learning needs. With an adequate period of support, with a facilitator who encouraged him but then gently withdrew into the background as he became more accomplished; Nick's use demonstrated that he was adequately prepared not only to take on ownership and accountability for his own learning needs, but to share his knowledge and practice. His use of technologies and developing autonomy reflects some of the stages that Steve in the previous chapter had passed through and that Kate in the earlier chapter was just beginning, but how these could be analysed further and interpreted leads into my final chapter where this emphasis upon the importance of context envelops all of these stories.

Chapter 7: Discussion

1. Introduction:

The design of my thesis has been based upon Wolcott's structure of description, analysis and reflection. In each of the previous three chapters I have described and analysed my key findings based upon a specific theme. I continue this structure here in my final chapter and have begun by using the research questions to analyse my key findings in greater depth across differing contexts of use. My response to these questions highlights that any use of digital technologies to support writing was entirely contingent upon the term context itself and the specific needs of the individual. I then discuss and interpret the issues raised in my analysis with specific attention to the theoretical concepts of Literacy and Disability as I consider how writing is expected to be enacted within educational settings, the tools used to produce these texts and where knowledge about the use of digital technologies to support students' needs is located. This is followed with a critical reflection upon my approach, my unique contribution to knowledge; including implications for practice and research methodology. Finally, my writing draws to a close as I not only consider the necessity for more research but greater contribution from those upon whom it is focused.

2. Context: A Collective Analysis of Key Findings

What were the contexts in which students used Digital Technologies, including text prediction, to support their writing?

My previous chapters described some students' use of digital technologies to support their difficulties with writing and some limited evidence of text prediction use, but the word context in my main research question was key. This one word contained multiple elements that needed to be unpacked including location, time period, cultural behaviours and enacted practices. The purpose of digital technologies and the needs of the individual were important but use also involved human behaviour and perception; not only those of the individual using the technology but any other agent present or involved in the setting. These all contributed to constructing the context in which any snapshot of use was embedded and influenced by theoretical concepts, particularly those of Literacy and Disability, within social and cultural practices. Therefore, before I begin this analysis of all key findings, I need to re-emphasize the significance of the context of time: the thirty-year time span in which it was set. This is essential because the development of specific types of digital technologies that emerged within this timeframe, impacted upon both the experience and opportunity offered to some informants and how concepts of Disability and Literacy were constructed.

The early 1980s had seen a period when computers not only started to become more commonplace in classrooms, but had also begun to appear in some homes (Warman, 2012). Ajay's first AAC device used in this timeframe was what he described as a 'word-board', but his first use of technology specifically for the development of written activity, did not occur until he was sixteen; a much later age than any first experience encountered by the three younger significant informants in this study. Yet the digital technologies from this earlier period would now seem archaic in comparison to the infinitely more powerful devices available today that some of the participants in this study slid so easily into their pockets.

2.1 Use of Digital Technologies

Did students use digital technologies to support their writing?

My key findings identified some students' using digital technologies to support their writing, but this depended entirely upon the context in which they were situated. Any assertion of use could not be stated without an individual consideration of the physical contexts in which this occurred, the actual task (analysed within a theoretical concept of Literacy); together with an examination of why and how such use developed. This invoked theoretical consideration of terms associated with Disability. Equally, from the examination of data from facilitators, developers and distributors of software, not only did some students not use digital technologies to support their difficulties with writing but importantly, not all students were given the opportunity to do so.

When text prediction was examined specifically, again the context and specific needs of the individual influenced any use. My key findings indicated that text prediction was not widely used and limited to what I have termed 'pockets of use'. There was no evidence to suggest that it was used to introduce text production to younger emergent writers (similar to my own early explorations with young children), other than those involving the support of Clicker grids for some writing opportunities. Young children's introduction to the composition and production of text came with the requirement to use pencil and paper. Text prediction was sometimes used, but only with slightly older children who had already experienced difficulties with writing or had a medically recognised physical impairment that it was considered impacted upon their use of writing implements.

2.2 Reasons for Utilisation

Who used digital technologies and why?

The key findings that related to who used digital technologies and why emerged from my examination of student use within educational contexts. Here, the use of specifically selected

digital technologies compensated for some individual issues with the demands for text production for academic activity. Some devices were also used to communicate with others and to construct texts that were then sent as email for personal purposes. This illustrated an example of Literacy within an ideological model. The digital technologies observed in use for spoken communication included a dedicated AAC device and a smartphone with text to speech also used as an AAC device. However, both examples represented only one of the many modes that these individuals used when communicating with others (expression and gesture being examples of others). Therefore who used digital technologies was contingent upon many factors and more usefully addressed by considering why individuals chose to use specific types of technologies. This required far greater depth of exploration and understanding.

Where use of text prediction was examined specifically, facilitators spoke of its motivating influence upon individuals who had previously produced little text, the support it offered to poor spellers and the wider range of vocabulary they then used. However, some noted that this was not necessarily an effective tool for those who already had efficient keyboard or touch-typing skills, or where its physical presence on the screen contributed to the complexities and demands of production. This key finding illustrated considerations that had been based upon an autonomous model of Literacy. My observations of use were limited to students with a physical impairment where it was primarily used as a means of reducing keystrokes but some also achieved this with the auto-completion of words. Illustrations of use were always totally dependent upon personal need and the reason why individuals either used, or wanted to use, respective technologies. It also depended upon the type of technology available.

One key finding drew attention to teachers' attitudes towards digital technologies influencing whether they were included in classroom literacy activity and if they were, how they were used. This invoked consideration of Literacy and how this had been constructed within classroom practice. Although both Kate and Steve initially used their technologies as a compensatory measure to overcome and remove barriers affecting their ability to produce text, these ultimately helped them both to work efficiently and independently. However, they each encountered either lack of awareness or negativity towards technology use from those holding power in their respective institutions. Kate, at ten, had this imposed and she was not permitted to use text prediction for formal assessment of written tasks. Steve, in contrast, had experience and parental support when necessary to contest barriers that prevented him from using his technologies and he had stood firm, even in the face of negativity from authority that tried to deny this use, including his university examination board. Steve was aware that his use of technologies contributed towards his ability to demonstrate to others his knowledge and thinking, but also to be literate. His technologies supported his literacy needs. They empowered him, but he also had sufficient confidence to ensure that those in authority heard his viewpoint. Here, tension between

agents clearly demonstrated conflicting perceptions towards use of technology and constructions of Literacy. In this illustration, Steve used technologies to demonstrate his abilities. He did not succumb to those who tried to deny this use and who would have ultimately suppressed or disabled him from functioning to his true cognitive ability within his learning environments.

All three of the students within my main study had difficulty with writing for different reasons, but they had each developed an approach with digital technologies to create texts independently and with greater efficiency than they had previously experienced. However, this use did not resolve all their writing issues because any measure of improved efficacy was individual. Technologies offered support or compensation to some, but they were not instant cures or solutions. Learning to use some technologies efficiently required significant investment in time and effort, customizing use and even then this did not always lead to success. Sometimes these attempts ended futilely as Ajay's experiences with one text prediction package had illustrated. The process was dynamic. It constantly evolved as either new technology emerged or individuals adapted their practice. Persistence was evident amongst those who continued with use, explored further and did not succumb easily to initial difficulties. So the question of why, became more importantly how, had individuals come to use their specific technologies initially?

My key findings indicated that facilitation was an important contributing factor in successful uptake of digital technology use. The initial impetus for use involved a facilitator (an advocate for technology use); someone with awareness, knowledge and understanding of a range of technologies to match and then try a technology based upon the individual's specific needs, but also to monitor its use in the early stages. Facilitation involved introducing students to digital technologies with an emphasis upon how the features of the technology could be used, rather than onus upon the device itself and then encouraging and supporting use during the sometimes difficult early stages. This led to my further finding that digital technologies were ultimately used most successfully in contexts where individuals had then undertaken ownership and responsibility for their own learning needs and persisted with use. The presence of the facilitator encouraged autonomy, offered support when necessary but, essentially, withdrew to the background as the student explored and refined use through independent consideration. Both Nick and Steve's use of their technologies exemplified this particularly. Their facilitators, Nick's visiting support teacher and Steve's parents, never dominated the process. They offered encouragement and support as each individual took control and learned to recognise their own changing needs, style of working and how these aligned with any evolution of technology. This was an important consideration in understanding why these individuals initially used digital technologies at all but also why they continued to use them.

2.3 Types of Technology

What technologies were used?

Informants used a range of digital technologies; hardware such as desktop computers, sometimes with the addition of access devices including switch and joystick accessories, laptop computers, specialist communication devices, handheld tablet technologies and mobile smartphones. Software included some used on computers but also applications (Apps) on mobile technologies. Some use was classified under a concept of Assistive Technologies whilst others within Universal Design but what was used was totally context driven and dependent upon the specific needs of the individual. However, it also required knowledge of, and access to, different digital technologies to trial and assess as well as the necessary funds to procure them, either through independent means, public or charity funding.

2.4 Use and Motivation

What were the digital technologies used for and what motivated this use?

Key findings that highlighted what purpose digital technologies had been used for, again overlapped with earlier findings because any use was highly dependent upon the specific needs of the individual and the type of device they were able to access both physically and fiscally. It is important to emphasize, however, that although some technologies offered potential; affordance only ever came from the way that individuals used their devices. It was the human interaction with the device that was key. The personal use of specific digital technologies had alleviated some of the issues that some individuals had experienced with previous attempts at text production; such as fatigue or physical access to the device. Other technologies used were simply an alternative or a development of physical hardware or software used previously.

All significant informants used their personalised digital technologies to produce printed text for their academic studies to overcome their difficulties with writing by hand. Viewpoints from facilitators, developers and distributors reported similar illustrations of use with other students. However, there were two further important key findings; satisfactory use of digital technologies required suitably matched devices, but this was dependent upon availability and linked to funding. It was illustrated by examples such as Nick's unsuccessful attempts to use a netbook at one stage that ultimately proved unsuitable because of the position of the keypad, but later more

successful use with mobile tablet technologies with an onscreen keyboard. However, any use demanded the resources to pay for them.

In some illustrations of use, a significant key finding was the use of personal funds to secure desired technologies. Both Nick and Steve's access to technologies were funded this way and meant that they used the specific technologies they had chosen and not those decided upon for them. In contrast, Kate was restricted to the older laptop that the school decided should be used. There were no additional funds available to purchase newer or alternative devices during my enquiry. Later, Steve accessed some financial support through the DSA when he began university; an amount that was usually sufficient to fund a laptop, some software and other hardware such as a scanner (Draffan et al., 2007). However, the DSA did not cover the cost of all the technologies Steve used. He was entirely dependent upon technology for all his writing and reading needs and kept a back-up laptop for contingency purposes. If Steve's technologies broke down; he was without a means to function independently with the demands of Literacy. This was an impelling reason for him to want to have control over the devices he needed.

The theoretical concept of Disability contributed to my consideration of issues concerning the funding of devices including any link with opportunities to the access or trial of digital technologies. Funding varied across contexts as the unpublished Gorton et al. report had earlier indicated (see :63). In some situations, students who might have benefited from different or updated devices were unable to do so through lack of finance. Alternatively others, like Steve and Nick, had used personal funds to purchase the devices they used. Steve's access to the DSA at university indicated that some financial support was available at this level of education. However, the timing of this was significant. It came at a late stage within the education process for some individuals and too late for others who might have benefitted. My earlier examination of literacy difficulty drew attention to those who had failed at school, were at risk within society or who had limited life choices because of their early difficulties with Literacy (see :51). The chances of these students achieving university entry and accessing any potential affordance of technology use, was far too late. They needed support or compensation earlier, when they were at school.

All use of digital technologies in this study was instigated and supported by a facilitator but what had motivated and maintained the use of digital technologies in school when this had not been prompted by the school itself? The schools Steve attended had neither initiated nor encouraged his use of speech recognition, including those that specifically offered dyslexia support. Additionally, speech recognition had not provided an instant solution to his issues with Literacy, since the software had required considerable effort to learn to use accurately in order for him to adopt. My attention, therefore, was drawn to the issue of motivation itself and what had

encouraged or enabled some students to pass through the initial, and potentially difficult, learning period in digital technology adoption.

All four significant informants representing the viewpoint of user were focused individuals; determined to demonstrate to others their ability and independence. They did not wait for others to resolve issues for them, even when physically they sometimes needed practical assistance. My knowledge of Kate was limited to one visit, but the "*frail bird*" I had indicated in my early field notes, reflected my initial impression of her based upon the first few moments of meeting; not the determined character that I later watched as she worked, nor the descriptions of her personality mentioned by both her support teacher and TA in subsequent conversations. Nick and Ajay's physical issues restricted their mobility but not their intellect or resolve. Steve took time to demonstrate the literacy demanded by his schooled contexts but agents within these had not understood his 'hidden' difficulties. In his case, a theoretical concept of Literacy had been narrowly defined and failed to include attention to his significant verbal ability that had only later (at university) been recognized as a significant strength. The words of Bandura echoed:

> *"Self-motivation through self-reactive influences, wherein individuals observe that their own behaviour, set goals, and reinforce their performances, is a major factor in a variety of motivational phenomena. Achievement motivation is one such instance. The higher the performance standards people set for themselves, the greater their attainments are likely to be. High achievers tend to make self-satisfaction contingent upon attainment of difficult codes; low achievers adopt easy goals as sufficient." (Bandura, 1977:162)*

All four significant informants in this study demonstrated determination. They had persevered with learning to use their digital technologies, particularly those that met discouragement or indifference from others within their educational contexts. Without such personal resolve and persistence, environmental and perceptual barriers would have made any use difficult. The abilities displayed by these individuals conflicted with any construct of Disability that had only focused upon deficit.

2.5 Location and Time

When and where were digital technologies used?

When and where digital technologies were used again overlapped with earlier considerations but this drew attention to diversity of use and the specific needs of the individual. Much of my research was located within educational contexts, so most focus was upon use of technologies in

these places or for associated activity. To illustrate: Ajay used his technologies for writing university assignments within his own home. Some of his technologies remained in a fixed place such as his heavy desktop computer and the switch access required to activate it. In contrast, his communication device was attached to his motorised wheelchair. In the late 1990s, Steve had benefitted from the introduction of computers with faster, efficient processors. These had provided him with more than basic word processing. Yet his use of digital technologies had only occurred as a result of his parents' efforts to explore available options and his own persistence. He had been without an independent means of demonstrating his abilities through text before the transduction (Kress, 1997) afforded by the use of speech recognition technology. This transformed (or translated) his speech to text on a page and represented the concept of Multimodality. From the age of ten, the discovery of these technologies, and their subsequent development, have provided him with the affordance not only to produce written texts but to do so independently.

The two younger students, Nick and Kate, were still in school during the timeframe of this research but any affordance offered by their access to digital technology differed markedly. At ten, Kate was the youngest and agents within her educational context had decided what she would use; an ailing laptop computer with newly purchased software for some written activity in school. However, she had access to a much newer device at home (funded through a government initiative). Her software could be described under the concept of Universal Design and, as such, was suitable for anyone to use, but Kate was the only one using it in her classroom. The processor on Kate's school laptop was old and slow, just adequate to allow the software to function. The portability of the device, however, was restricted by the age of its battery and required a power supply negating its convenience. Ironically, it was the mobility afforded by her wheelchair that enabled her to reach the power supply and use her laptop.

It was not only access to power that restricted Kate from using her laptop. The device itself was far too heavy for her to support unaided on her lap and there was no tray on the wheelchair to place it. The height of her desk had been customized so that her wheelchair could slip underneath but this was only available within the classroom. Kate's independent use, therefore, was restricted not by a lack of access to digital technology but by physical obstacles in the environment; including a restriction upon the locations in which she could write, despite possession of what should have been a portable device. Without funds to provide her with an alternative at the time we met, Kate's contexts for use were far more limited by physical access than those of Nick; but also restricted by perceptions of others towards her use of technologies for specific activities. In Kate's school, any concept of Disability was defined by the context and not personal deficit.

In terms of weight and accessibility, Nick had the most mobile technologies of all; his tablet device and smartphone. He used the tablet in school but sometimes made use of a desktop computer at home for extended writing. His smartphone served a number of purposes; both for text production and as a communication aid if he chose to use it. However, attention is drawn again to the key finding indicated earlier that these devices, like Steve's, had been privately funded. It was not until a year later that a tablet was finally financed through school funding and then it had to remain in school. Nick had other technology at home, so this was not the issue for him as it may have been for others. This type of digital technology also enabled work to be emailed across devices with a wireless internet connection or stored remotely through cloud or remote storage systems. Therefore documents could be used and accessed across devices. Ironically, however, by the time the school had caught up with purchasing the necessary technology for him (a year after he first started using his own), Nick had purchased an updated version of the tablet himself. Again, the introduction and facilitation of his digital technology use had not come from within the school itself. The school also lagged behind both in terms of awareness and knowledge because even when the device had been bought; the staff responsible for supporting his needs in school had still not realised that basic issues like internet access, wedges for support and positioning, together with the additional purchase of specific Apps were a necessary part of using the device to address Nick's specific needs. He had been the one who needed to explain this to them. Nick's use of technologies, therefore demonstrated how the environment could impact upon an individual's access to Literacy and how a construct of any notion of Disability required focus upon an individual's abilities. This included constructing a learning environment that recognized the needs of all learners and provided learning opportunities that made use of the abilities individuals possessed.

Again, by focusing specifically upon the younger three because of insufficient knowledge of Ajay's early school years; not one individual in this study had encountered the impetus for technology use, with continued support and knowledge, from within their own school contexts. Even in the examples represented through Kate and Nick's use; their facilitator was a member of an external advisory service from the LEA. She arranged the initial use of technology in the schooled context and ongoing negotiation with school staff, but it had taken persuasion for Kate's teacher to understand the reasoning behind use and the physical benefits this provided for Kate by offering use of a keyboard instead of persisting with handwriting. Yet, text prediction still had to be turned off for written literacy assessment. The incongruity of this situation was illustrated by the fact that had Kate been six years older and using her technologies for high stake assessment, with the requisite approval from JCQ[22], she would have been able to use it. Therefore, in a schooled context, although able to use technologies for some writing production, Kate was unable to use

[22] 2010 -2011, 2011 -2012 Guidelines

text prediction on an everyday basis, under a model of Literacy narrowly defined by agents within school and where concepts of Disability were defined by insufficient attention to the context.

A year after first using his tablet in the classroom, the school eventually provided Nick with one; but only the tablet itself. Nick still had to pursue staff to obtain the Apps and internet-access he required. Steve's first use of speech recognition was initiated and supported by his parents' endeavors. He learned to use it at home, but when he first began to use it in school he had to do so in a separate room, away from his classroom and peers. Where Steve and Kate's technologies could be used, therefore, was at the discretion (and control) of agents within educational settings where some questioned their necessity. In Steve's situation; his 'hidden difficulty' with the production of writing, with no obvious physical impairment, was incomprehensible to some staff. In contrast, once technologies had been introduced to Nick, they were readily accepted by teaching staff as his method of writing that overcame any physical issues. Acceptance of use in Nick's context seemed to be influenced by the presence of a visual, physical reason for difficulty. Again, concepts of Literacy and Disability appeared to have been interpreted differently in each situation but they remained fixed and defined, rather than fluid.

My key findings indicated that knowledge regarding the existence and use of digital technologies for writing support was poor within these students' schools. When Steve entered the high stakes examination arena, even though he was permitted to use speech recognition for both GCSE and A level exams (under specialist guidelines and JCQ exemptions), this knowledge was only sourced through further parental investigation; it had not come from the school itself. He encountered the same lack of awareness when he started university and although he found greater freedom and acceptance of his use of digital technologies on a day-to-day basis there, it still required insistence and external influence to convince the examinations office that speech recognition technology could be used. Steve made use of the affordance of digital technologies through awareness of his own needs. This was exemplified by his initial use of text prediction; but subsequent rejection. He became an expert in the use of his specific technologies, including speech recognition, but also in recognizing how these supported his learning. Yet, this knowledge had not come from the school or university, but through facilitation (his parents' initial enquiries, instigation and support) and subsequent personal persistence and endeavor. Without the use of digital technologies, both Steve and his parents firmly believed that he would never have achieved the necessary qualifications that ultimately allowed him to gain entry to university.

A further key finding was the common factor within the early stages of initiating use; the existence of a facilitator, someone with sufficient knowledge to instigate the process of investigating digital technology use with each student, supported early utilization but who worked towards the ultimate goal of independent use and exploration. The student then took

control of his own learning needs and use of technology. He chose for what purpose, when and where technology was best used. Steve and Nick's use exemplified this overlap of consideration between theoretical concepts of Literacy and Disability through their use of digital technologies. It involved the facilitation of support but did not foster dependence. In these specific contexts, these students were introduced to technology but they took up ownership, persisted and subsequently continued to work towards finding affordances that suited them best. Technology was not a solution but an ongoing exploration. It was not perfect. Sometimes these individuals had to compromise by nudging and shaping existing technologies to best fit their needs and adapted their use as new ones emerged. Thus the contexts in which they used their digital technologies were never permanent but dynamic, requiring ongoing assessment and refinement.

Finally, even when the use of digital technologies was accepted in the learning context (the classroom); the high stakes examination arena interrupted the process. As Steve had learned, and Nick was just discovering, formal assessment prioritized traditional formats of historic writing practices and writing tools, despite the ever-increasing production and availability of digitally produced texts in the social and multimodal world outside its doors. Some students' use of technology, even if usually used within their everyday literacy activities, was considered as 'alternative' and required dispensation as 'access' arrangements with relevant examination boards under a concept of Disability. This again illustrated the complexity of analysis and how the theoretical concepts of both Literacy and Disability and their subsequent interpretation impacted upon the other. So, I will try to interpret some of the complexity I encountered.

3. Interpretation

I began interpreting my findings by recognizing that any consideration of digital technology use had to be based upon an understanding of the specific, unique needs of the individual and the context in which they were situated. It required an examination of the precise nature of the writing difficulty experienced and how this related to theoretical concepts of Literacy and Disability, in terms of interpretation and enactment of literacy practices. My key findings identified and illustrated digital technologies being used to support writing successfully in the contexts where they had been matched to the specific needs of the individual. This was not the result of any imposed application but through the individual being actively involved in their selection. In these circumstances, digital technologies were not merely tools embraced by the user to enhance the creation of text but enabled them to be active and independent learners.

3.1 Communication and Literacy

When the students in this study used digital technologies successfully; they employed these as part of their literacy practice within a theoretical concept of Literacy in its widest sense.

Technologies were not used to embellish activity but to enable individuals to communicate effectively and productively, but also independently. However, this was not always understood by everyone operating in students' learning environments as Steve discovered when he first tried to use speech recognition in the classroom (see :162). This appeared to result from two specific issues. The first related to key findings that highlighted a lack of awareness in schools concerning the availability of digital technologies that supported the writing process. Secondly; that the adoption and use of digital technologies required a clear understanding regarding the reasons and purpose for implementation and how this related to, and supported, a student's specific needs. Effective use of technologies also required agents operating within the student's learning environment to think about present, ongoing and future literacy needs. Interpreting Literacy and Disability (as theoretical concepts) invoked the need to explicitly understand any associated terminology in relation to how these terms were used within the student's learning context and what they described.

The source and dissemination of digital technology knowledge and its potential affordance was an important consideration and again reflected how Disability and Literacy, as theoretical concepts, had been constructed and interpreted. In every illustration of use, a third party (termed as facilitator in this study) introduced specific technologies to the student. The student had not received information or initial support from within his own school. Knowledge regarding any potential affordance of digital technology use was therefore unfamiliar to the agents who demanded the production of text within the learning environment. Yet, for genuine affordance anyone involved with the student needed to understand how the use of technology supported learning and the student's specific needs. Although fundamental, this did not always occur and resulted in potential confusion and even conflicting opinion in some instances. Viewing a student's successful use of technology and the differences this use made to the learning process, sometimes paved the way for comprehension, informed opinion and even policy change as Steve's story had illustrated; but the initial stages of introduction were critical. In some instances, the student may have been the first and only individual to ever use technology in this way in a school and therefore had to forge the path as a pioneer.

Appreciating why some technologies were useful required understanding a student's specific needs. This invoked theoretical consideration regarding terminology associated with Disability and 'learning difficulty' to see whether these terms reflected social and cultural issues within the learning context rather than personal deficit. Comprehending difficulties with text production also entailed considering the concept of Literacy beyond the completion of a written activity within the classroom setting. Again, this required examining the ways that we, as a society, interpret terminology associated with Literacy, including the significance attributed to such terms. Additionally, it was important to consider the value given to specific modes that enable

humans to effectively communicate and share meaning with one another. This was where the theoretical concept of Multimodality assisted with my interpretation. The work of Kress (1997) illustrated that meaning could be induced, represented and interpreted between and across modes (see :61). It could be provoked by an external prompt, represented by image and sound or through thought or sensory impression. The theoretical concept of Multimodality recognized that communication was never merely attributed to a single mode because meaning can be recognized and transferred between modes in a process described as '*synaesthesia'* (Kress, 1997). Many modes can be used simultaneously In this process "*with relatively little or no restraint, or constraint to use one rather than the other*" (ibid :38). Communication, therefore, involves the process of both translation and transduction (Kress, 2003a). This prompted consideration of the variety of modes that we use when, as individuals, we try to communicate effectively. We may not always depend upon one alone.

Contributing to this deliberation was another important consideration involving the theoretical concept of Literacy and Multimodality, again drawn from examining Kress' ideas. This concerned the way that young children make use of materials around them to demonstrate meaning. In an earlier reflection, I had described some children I had worked with just beginning to engage in text production in an environment filled with differing medium and modes, including digital technologies (see :32). Quite independently, these children had used individual ways to construct and convey meaning. This included drawing or taking photos. They eventually moved towards producing alphabetic text, but the process did not originate from emphasis upon it. These children had been situated in an out of school program that provided the opportunity to experiment and play with text in an exploratory, multimodal manner under a concept of Literacy which could be interpreted within an ideological model. However, formalized schooling in the UK interrupts any freedom of choice in mode by demanding alphabetic text early; a mode that is then given increasing emphasis and status with each passing year in the system (Kress 1997). For some individuals, this rapid focus upon a single mode of production, and one that holds such significant value in the learning environment, can create difficulties. Steve's early experiences in the classroom demonstrated this. His difficulties, where the term 'difficulties' is now used with care, were instigated by the cultural and social demands of his schooled contexts and their expectation of Literacy (as a theoretical concept), which prioritized and expected the translation and transformation of spoken language into alphabetic text.

Steve's difficulties were attributed to dyslexia and dyspraxia. Yet his verbal abilities were a significant strength and through these he could demonstrate his intellect and learning. However, his early classroom experiences were set in a social and cultural setting that expected meaning to be created and demonstrated through the one mode of alphabetic text alone. There was no adjustment or differentiation in classroom activity, amidst a construct of Literacy that had created

a normalized expectation of reading and writing at linearly acquired rates and ages. This expectation ignored Steve's abilities but exacerbated his difficulties with alphabetic text. In this example, under a theoretical construction of Disability, Steve's inabilities were attributed to personal deficit rather than the demands of a learning context that not only focused upon one mode for the construction of meaning but did not create opportunities for differing strengths and abilities through the use of other modes.

Access to digital technologies, particularly as these have matured and become more sophisticated, stable and reliable, may offer affordance as a means of transduction for some individuals, permitting them opportunity to shift presentation from one mode through to another. These may offer a compensatory resource for individuals with physical impairment or issues with writing and an alternative method of producing text in contexts that have specific demands with Literacy. In Steve's illustration of use, speech recognition software translated his oral command of language into the monomodal text insisted upon by his learning environment. However, it brought other demands. Steve had to learn to use the technology and it did not offer an immediate solution. Eventually, and with perseverance, he was able to use speech recognition and this then offered him a means of transduction into the mode that his educational contexts both demanded and valued. Steve's use of digital technologies offered this affordance. Without them, his cognitive abilities would have remained 'hidden' in his schooled contexts and his abilities with Literacy, now so evident in the subject he pursues at university, would have been suppressed, not cultivated. However, convincing everyone in his educational contexts of the affordances technologies held for him, had not been easy.

Assessing a person's understanding and thinking through a communication process that only emphasizes the singular mode of alphabetic text excludes individuals who have difficulty using this mode. Yet this is what the social process we call schooling places emphasis upon from a very early age under a concept of Literacy that places emphasis upon an autonomous model. It was illustrated by Steve's experiences in his first few years at school but also those of other prominent individuals whose own early schooling was affected by their inability to conform to classroom expectations of Literacy, yet exhibited significant talents once leaving the schooled environment (see :154). The first few years of formal education are critical for later learning, but without consideration of the variety of modes that learning can be engineered through, some children are set to fail within the system from their earliest days of schooling. Under this model of Literacy, difficulties are attributed to personal deficit rather than the inflexibility of an unaccommodating learning environment.

This *deficit* is observed in schooled environments where value and emphasis is placed prominently upon interaction with text but where other modes of communication are not prized

as highly: even though speaking and listening are components of the English Literacy curriculum. In contrast, it is evident in other fields (Mathematics and Music provide useful illustration), that communication and expression of meaning are not the exclusive domain of alphabetic text. For some individuals, it is only once they have left any institutionalized practice of schooling that they find outlets in which their own modal strengths are recognized and valued[23]. Certainly, both Steve and his parents felt that life was easier and the use of technologies more readily accepted, once he had left school. At university, his oratory skills were then given value within the subject that he had chosen to pursue. Yet these opportunities do not happen for everyone and, for some, negative school experiences have had a detrimental impact upon their entire lives (see :155).

Considering Multimodality, as a theoretical concept, therefore was important because it offered a means to comprehend the differing ways that meaning can be expressed. This includes the process of synaesthesia that Kress describes as a trait of human ability particularly evident in children. However, he also attributed the lack of it in adults as a result of suppression in "*writing-centred western cultures*" (1997 :39). When schools only emphasize meaning-making solely through the mode of alphabetic text, ignoring other modes or assigning them lesser value; this holds significance at a personal level for those for whom this exclusion does not suit or who cannot conform to the requisites of a setting that pays them little attention. However, it also holds significance for social and cultural development. West (1997) drew attention to individuals, such as historical figures and leaders who he described as "*original thinkers*," with strengths in areas such as problem-solving and creative thinking. He described others who have excelled in fields such as architecture, engineering and art; domains of knowledge that do not rely upon communication exclusively through the mode of alphabetic text or even the language of words. Yet many of these individuals have also shared a common trait; difficulties in their early years of schooling which West described as the "*paradoxical pattern of mixed capabilities*" (ibid :12). They had found basic knowledge difficult, yet advanced easy, or displayed proficiencies in some areas of ability but also "*surprising and unexpected deficiencies"* in others (ibid :10). West's writings illustrate that individuals vary in the strengths they display in differing modes but he also emphasized that expecting knowledge to be only acquired linearly may not necessarily be the best way to generate new understandings.

The combination of these considerations led to my reflection upon the social and cultural implications if Literacy is merely interpreted theoretically as a fixed concept, and where any expectation of ability is only defined by a measure of skills acquired linearly according to chronological age. If the mode for communicating meaning remains singular and ignores any concept of Multimodality, this creates issues for the way in which some individuals learn with greater efficiency and the mode they prefer to use to express their abilities. In addition, if the tools

[23]See: http://www.bdadyslexia.org.uk/about-dyslexia/famous-dyslexics.html

we associate with Literacy are not evaluated, particularly when they do not emulate those used in the communicative practices of the social world; where texts are not crafted and distributed with handwritten precision, this again precludes some from participating in Literacy within schools. More importantly a restricted concept of Literacy illustrates a distinct lack of consideration for the multifaceted ways in which we, as humans, create and distribute meaning.

3.2 Disability within Learning Spaces

If issues with effective communication exists for those with mobility and a voice that can be heard, what about those whose freedom of movement or ability to communicate is complicated either by the impact of impairment or the perceptions of others within their social and learning settings? My research offered a limited opportunity to interpret the differences in educational and social contexts between Ajay and Nick and the emergence of digital technologies in the intervening years. Ajay had been constrained in his childhood by a concept of Disability defined as personal deficit. This period segregated individuals to specific educational environments, social barriers had yet to be breached and technologies were still to emerge that enabled the intellect trapped within bodies to be realised.

In contrast, but at the same age and in an entirely different context sat Nick. He was not necessarily positioned in a bright free space with limitless boundaries, but at least within a context with learning spaces in which he could both exist and participate. He attended a local mainstream school and used technologies that have created opportunities, allowing him to nudge and stretch boundaries so that he can shape the educational space to accommodate his needs but, essentially, he exists as a contributing member of that society. The features and portability of emerging tablet technologies have recently given him greater accessibility to engage in Literacy. These devices have enabled but also encouraged him to explore technologies further for himself. He has begun to extend and exert the independent thinking that he will need in the future and has learned skills that will help him further his opportunities, not just in school, but also in the social world beyond. He wants to move into higher education and has greater prospects for obtaining meaningful employment than individuals without effective literacy abilities .

Yet Nick's use of technologies have demonstrated far more than just a consideration of support or compensation; the way he developed his knowledge was of particular interest. He and his facilitator have learned from their combined experience and have been able to extend knowledge into the other networks in which they participate. They illustrate an example of learning based upon valued contribution and participation, and demonstrate that although the use of technologies required knowledge to ignite initial awareness; it was not based purely upon the existence of expert knowledge assessing need but obtained through shared consideration, communication and trial. The discovery of specific types of technologies have then given them

both access to new learning opportunities to explore. Yet this illustration has also demonstrated the practice of facilitation and learning. Nick was introduced and supported with technologies initially but he ultimately took over responsibility for his own learning needs. Support still existed but was gradually withdrawn into the background. It remained as a safety net but the emphasis was firmly placed upon Nick becoming an independent learner, encouraged to explore his own needs and technologies. It was an example of social practice that fostered independent thinking and autonomy through learning rather than one that merely dispensed knowledge.

Nick's experiences also demonstrated an enlightened concept of Disability based upon consideration of context not personal deficit. Nick has always been with peers and family; not segregated educationally and socially according to impairment. Nick's character, determination and personality were part of this drive, but the social and cultural settings in which both players were situated have played a significant role in how they have been able to perceive themselves as individuals and the potential opportunities before them. Nick's use of the various digital technologies he has encountered, at differing stages of his life, have reflected not only the varied contexts in which some could be used, but also new contexts that can be created by using them, opening up learning spaces and not shutting them down. His example of use has illustrated that any consideration of the contexts in which digital technologies were used was far more than application or consideration of levels of compensation and support. Access to digital technologies for Literacy was essential for some individuals and concepts of Disability were defined more by lack of contextual consideration than any personal issue.

3.3 Individual Consideration

The use of digital technologies in this research also highlighted that the use of any type of technology always required consideration based upon specific, individual need. The way that each device was used depended upon function, desired outcome but, essentially, how the user felt about using it. This awareness was not instant. It took time to fully realise and was still subject to change. Therefore, the need to try different types of technologies, adjust the way they function, and consider the contexts in which these might be best used were all essential issues. It was only through personal experience that the students in this research found out what worked for them. It was based upon individual consideration, never a blanket approach; or one-size fits all 'remedy' or 'solution' to writing difficulty.

In each context digital technologies varied according to the specific needs of the user. Every student used their own technologies in a way that they felt suited them best. Steve used speech recognition to construct text but this was unlikely to be of benefit in its present form for Nick because of his complex communication needs. Conversely, Steve could not use a keyboard for any length of time, whereas Nick discovered he was able to communicate with new types of tablet

keyboards. Ajay used his computer with specific tools and software, but was restricted physically to the place in which the technology was situated. In contrast Nick, with the affordance offered by smaller, lightweight and portable tablet technologies, could use these in a multitude of locations. Nick could read whereas Steve found reading for any extended period difficult and required text in an accessible format to use text to speech applications. Kate could read and construct text, but she did not have accessibility to the portability of a lightweight device or the opportunity to use technologies consistently. These were only four students but each had unique, complex needs and demonstrated differing illustrations of use. However, their experiences also illustrated that although technology advances rapidly and offers new affordances, it does not necessarily make use easier or that the technologies that exist are necessarily suitable for everyone in the way that they are described.

3.4 Access and Opportunity

Technologies may have introduced new benefits for some but they also brought issues of inequality to others. The rapid advance in their production and innovation appeared relentless. Purchase required awareness of sources for funding or independent means, but finance was not always available through education or disability funding. This meant that although specific technologies existed and offered potential benefits to some, the cost deterred consideration for others, leading to denial of opportunity. The ability to finance technology use needed to be included in any consideration of Disability for some individuals.

The emergence and development of tablet technologies, such as those Nick used, complicated the picture furthe The devices themselves were expensive and, at the time this research took place, few were in UK schools, although this was changing. Their appearance heralded a sudden explosion of affordable pieces of software (Apps) that could be easily downloaded from an online marketplace. Nick used some of these to construct and produce text, but others offered potential affordance to further the boundaries of verbal communication. Instead of the larger, expensive, cumbersome communication device that he no longer wanted to use, his mobile devices offered him a voice. This signaled a major shift in expectation within the arena of AAC (AAC-RERC, 2011); speech could now be generated from a mobile phone; a commonplace artifact within society. Yet, at the time Nick first started using his particular devices, these objects were also highly desirable. He possessed technologies that other students admired; instead of a clumsy specialist device that drew attention to difference. This shift also changed expectation; using a mainstream device for what was once only obtainable through specialist technology. It blurred the boundaries between technologies that would once have been termed as Assistive Technology with functions that were now available on a mainstream device. However, Nick's use also highlighted how little the staff in his schooled contexts were aware of the significance of these changes.

3.5 Professional Awareness

A student's ability to produce the culturally expected mode of alphabetic text was affected by the extent to which power-holders (teachers) understood a student's specific needs and were aware of the existence of digital technologies to support these. Technologies existed, but they were not widely used and entirely dependent upon those with knowledge to initiate interest. In the contexts where technologies had been used in this study, these had not been facilitated by staff from within the student's own school, but through external influence; such as a support service or the result of parental investigation. Access, opportunity and support, therefore, were important considerations contributing to any theoretical understanding of Disability as a concept. The commissioned Gorton report (see :63) had illustrated a piecemeal approach regarding access to technologies for those who would benefit but its lack of publication meant that its recommendations were not made public. During the period of this research, support services were being closed or restructured and this had led to further concerns from some facilitators that not all of the students who would benefit from the potential affordance of technology were necessarily being given the opportunity to explore it.

Yet, even when students were able to access technologies, one of this study's key findings emphasized that their availability did not necessarily mean that classroom staff fully understood the reasons for implementation or even permitted the technology to be used for all Literacy activity. Although it was important to acknowledge that the exponential rate at which digital technologies constantly appeared would cause even the most ardent difficulty keeping abreast with; it was the lack of consideration for using technology to provide support or compensation that raised the greatest concern with facilitators. There was little in the way of professional research bases for individuals to turn to if they were interested in furthering their own knowledge about such provision and no specialist qualifications in this area. Those with experience generally achieved this through their own exploration of resources and an investment of personal time. They participated in training opportunities for personal interest in their work with students. Some belonged to networks of likeminded individuals and supported one another in an informal sense, but they also disseminated information based upon personal experience rather than objective research. Unlike the informed research base for AAC; one for the use of digital technologies with students with specific needs just did not exist. Thus, the only knowledge base that was available was gathered through informed opinion rather than any recognised professional source of knowledge, organisation or qualification.

3.6 Digital Technologies as Writing Tools

This lack of a professional knowledge base concerning the use of digital technologies and specific needs focused my attention back to the topics of opportunity and communication I had

considered earlier. I needed to think about the subject of writing and the tools associated with its production. Thus, my interpretation developed from unpacking the meanings I had encountered throughout my research associated with the term *writing* in order to employ greater precision with examining the 'difficulties' that some informants had experienced. It was apparent that the students of today's classrooms were still expected to produce text by hand with a pencil or pen just as previous generations of students had in the past. Although my research demonstrated that some students used digital technologies to assist with their writing; this was not necessarily an accepted component of Literacy when it was practised within schooled contexts.

I began by considering writing as one element of human interaction and communication within a theoretical concept of Literacy. This included recognising that writing is not an innate ability but a social construction developed to translate and represent language into a recognisable, visible format. In the English language, the term *writing* can be used as both verb and noun. It implies a physical action but also a visible product. Writing conveys meaning but if this is to be understood, the format needs to be commonly recognised amongst those who share it. A young child's marks on a page are only recognised as 'writing' when they conform to the common symbols depicting the language they represent. This symbolic structure or code differs between cultures, so the symbols used to represent meaning in English (which I have described throughout this thesis as alphabetic text), are not the same as those for Japanese or Arabic. In addition, even though some languages use similar symbols; they do not necessarily represent the same units of sound.[24] Significance is, therefore, attributed to these marks by the culture in which they are used. This requires learning the code; what the symbols represent, how to create them and significantly, independent activity if one is to be considered literate. A concept of Literacy, therefore, involves competent use of a culture's symbolic representation of language.

Within my review of literature, I had considered the processes involved in the action of writing and referred to the stage of *text production*; a term that Hayes later revised from an original term of *translation* in an earlier model of writing (see :18, 54). I also indicated the explicit processes within this stage with regard to what was needed to physically execute the task and how these related to specific issues that some individuals experienced (see :152). This included the independent physical creation of the alphabetic code to convey meaning but also the rate at which this acquisition is demanded within an autonomous model of Literacy in schools. All of these factors contributed to the way in which Literacy, as a theoretical concept, had been enacted within the contexts I had examined and how the abilities and disabilities of students had been interpreted.

[24] e.g. the 'le" in the English word 'little' or 'letter' for example, is quite different in sound to that used in the French 'le chat'.

The production of text in schools remains strongly focused upon the ability to use a pencil or pen despite the presence of any digital device found upon the premises. This was not only evident in the classrooms I entered but also in the high stakes examination process where students were expected to use a single, uniform tool (the pen) in order for their ability to be assessed. The Joint Council for Qualifications in England uses specific terms within the application process that permits the use of digital technologies in high stakes examinations and only those who meet specific criteria of need are eligible to apply to use digital technologies as a *'reasonable adjustment,'* an *'access arrangement'* or as *'special consideration,'* despite the fact that part of the criteria is the need for these to be an individual's '*normal way of working'* (JCQ, 2012). These terms imply that the use of digital technologies for communication is unusual. Yet, one only needs to look at any social and cultural activity in a public place or business context to notice that text is not predominantly constructed with handwritten precision. One possible reason for the use of pens and pencils in massed assessment practices is the fact that they are cheap, expedient tools that are easy to administer or control. However, their exclusive use holds significant consequence for those who either have difficulty physically manipulating such tools, where they are simply not the most expedient mode for communicating meaning or do not permit individuals to demonstrate their true cognitive ability.

In schools the ability to create meaning through text is termed as writing. It is part of Literacy, as a theoretical concept, enacted in these contexts. However, Graves (1994) also described writing as a "*craft;"* because it not only requires time to practise and refine but cannot be developed without regular participation and engagement. Yet, in order to convey meaning the individual requires sufficient competency in understanding, translating and producing the requisite symbolic code as well as the physical skills to do so. Schools also construct normalised expectations of writing based upon chronological age but these, as I have examined earlier, are not necessarily achieved by everyone at defined stages of acquisition (see :50, 155). If individuals find it difficult to produce the requisite symbolic code they will be unable to *engage* in the act of writing. They cannot conform to classroom expectation and the consequence of not writing means that the ability to write is not developed. It is an illustration of the Matthew Effect (Merton, 1968) whereby those who engage in an activity further their ability and those who do not, fall further behind. The only way that this will change is if something happens to instigate it. One consideration is to make use of other modes that will support, compensate or motivate activity and enable an individual to experience and take part in writing. This is what occurred when the individuals in my research began to use their own digital technologies to produce text.

Outside of schooled contexts, some individuals find it socially acceptable to admit difficulty with maths, drawing or music but rarely with reading or writing. Yet, even though technologies exist that enable or assist with text production, this use is restricted within the schooled environment.

My review of the literature suggested one possible reason; the perpetuation of particular practices (habitus) in schooled contexts by teachers whose own perceptions have been influenced by personal experience (see :53, 152). If one translates this to the experience of writing specifically; the text production that these teachers demand in the classroom re-enacts how they learned to write. For some, their era of schooling may have occurred before digital technologies appeared in the classroom (pre 1980s), whilst younger teachers may simply conform and perpetuate the practices of the institution they enter. When teachers have learned to create text in a specific way by using particular tools, this becomes their notion of 'writing.' They may not even be aware of the processes of construction and production such as those that Hayes identified, or considered the complexities the act involves for those who have difficulty or impairment. This leads to acceptance and perpetuation of existing practice.

In order to change practice, there has to be an impetus that makes this happen; but schools retain historic practices. For three decades these social structures have possessed an array of digital technologies that students could use to produce text. Yet these have not been used for regular engagement in text production or assessment practices. This is despite the fact that writing constructed with a pen in a linear fashion, may be transformed and produced quite differently to the text produced through technology (within a concept of Multimodality) and may benefit and support some individuals' needs. Digital technologies may not be an efficient, productive tool for everyone. They may not be expedient tools for every context but some individuals are unable to express their true ability without using them. Perhaps reasons for this lack of acceptance remain wrapped in notions of habitus, historic practice and the process of massed education. It may involve hierarchical decisions concerning affordability and expediency. These remain debateable but what is certain is that if individuals are denied access to resources that support their needs this contributes to a concept of Disability that continues to focus upon inability and personal deficit rather than failure of the learning context to consider the implications of perpetuated practices.

In schools, children once learned to write using chalk upon slate. Subsequent, cheaper industrial production in the early twentieth century led to the introduction of pencil (and paper) and this practice has continued. Those unable to manipulate these tools or master the alphabetic code were once seen as deficient in some measure and their intellect remained hidden or trapped by such expectations. The emergence of early digital devices from the early 1980s onwards significantly changed this for some individuals and permitted them to engage in Literacy. The ability to edit text on a screen was truly revolutionary in this period and yet all this can be so easily taken for granted today with the press of one icon on a screen. Large devices that are fixed to specific locations are no longer in such demand particularly when they draw attention to difference or inability. Terms and concepts that have attempted to express inclusion or equality

have appeared since this period, including those of Accessibility, Assistive or Universal and Inclusive Design. Yet, opportunities to create and express meaning through modes that enable or permit evidence of ability and intellect are still not universally available to all that might benefit from trying them.

The purpose of my research has been to examine the contexts in which digital technologies were used to support students with writing difficulties and although I discovered some evidence of use, any awareness of the range of devices available and how they could be used was limited in schools. Yet these are the social structures that our culture has created where individuals are expected to emerge as literate, functioning members of society. Schools have had access to a range of digital technologies for three decades now, paid for from public funding but they still do not use these as everyday writing tools. They have not been incorporated into Literacy as it is regularly enacted within the classroom and some teachers still do not regard these technologies as contributing to such activity. However, interpreting why this was so, was fraught with challenge. It required considering how the theoretical concept of Literacy had been interpreted and practised within these contexts.

Pens and pencils are simple, cheap writing implements that are easy to acquire. These tools are easy to regulate in the mass assessment practices our culture gives significance to. Yet, if these are prescribed as the only tools to be used, such emphasis does not provide for equal opportunity because it enforces one mode alone to transfer meaning and assess ability. Other factors such as including technology use as part of everyday practice may still be perceived by some as too complicated, expensive or unpredictable to use. Some teachers are simply unaware that some types of technologies exist. However, any possible further interpretation for these viewpoints require far greater depth of investigation than my research uncovered, but it was eminently visible that digital technologies were not used as part of an everyday, accepted practice within any concept of Literacy within schools.

Yet this emphasis upon one mode alone for the creation and transference of meaning does not represent the communicative practices of the social world. It does not prepare students to access or use some of the technologies that might still exist by the time they leave school and certainly does not reflect the ones that many are using in out of school contexts anyway. So were technologies simply not used widely for writing because they were too expensive, dated so rapidly in our consumer lifestyle or were merely too difficult to administer by teachers? Perhaps interpretation lay within a view of the educational system as a social process whose construction still resembles and perpetuates similar learning practices that previous generations have experienced. More importantly, involving and including those with specific needs was not part of the massed school process at its inception. In this early period, the bodies and voices of these

individuals were hidden and sometimes locked away, out of sight and sound, in the institutions that the UK has since abandoned. Yet, the shadow of those walls remain in some contexts. Inclusive practices attempt to break down learning barriers. They try to include and make adjustment for difference, but this does not occur in every social context.

Digital technologies may enable and transform communication for some individuals and terms that describe them will continue to emerge and be debated. The distinction between some technologies once considered to assist or enable and those in mainstream use, are becoming increasingly difficult to distinguish between. Technologies incorporating what we presently call Inclusive or Universal design continue to blur these boundaries further. One only needs to stand in a public place to see that digital technology use is part of the social world, even if it is not reflected in school Literacy practices. My key findings have illustrated that the use of digital technologies offers some individuals the affordance to write and to develop Literacy. This use enables some individuals to participate as literate members of society, independently; to communicate and access learning opportunities. However, this use is not universal and some individuals still remain floundering in educational contexts where a construct of Disability influences Literacy practice and continues to place emphasis upon personal deficit rather than questioning the learning environment itself.

4. Critical Reflection

My critical reflection begins by looking at the timeframe that contained my research because it started from a period when digital technologies first started to appear in UK schools during the 1980s. This also involved the time when policies, implemented as a result of the Warnock Report (1978) and Special Educational Needs Act (1981), brought changes to the educational settings and experiences of students with specific needs. Both of these contributed to framing my research amidst a developing theoretical construct of Disability that shifted emphasis away from a medical model of deficit towards one that sought greater social and environmental awareness.

To investigate the use of digital technologies with students for their writing difficulties I found myself enmeshed in a research process that was like the shifting sands on a beach, undulating and changing with each new tide. The sands on the beach were the people and places, but as the tide washed over, this created new contexts to consider. The water became the spiraling nature of the ethnographic perspective I adopted and found myself immersed myself within. It gave my research a constant changing but evolving sense of time, place and space. So what have I learned from my approach and the experience?

There were three elements in my research that were of particular significance. These involved my framework, the intermittent nature of some data collection and the ethnographic perspective

itself. The first of these: my creation of the Contextual Consideration Framework framed my research and focused my attention on key strands. It allowed me sufficient flexibility and scope to explore each strand separately but consider the influence of one upon another. Each demanded using key theoretical concepts and terminology because any attempt to examine the affordance of digital technology use required an understanding of the theoretical concepts of Literacy, Multimodality, Disability, Universal and Inclusive Design and how these were interpreted and enacted by agents in each of the contexts being explored. The discourse that emerged from intermittent technology-mediated conversations provided a wealth of data. Their construction not only encouraged participation but also permitted a body of knowledge that accumulated over time. This captured both the change and the dynamics of digital technology use. The third element; adopting an ethnographic perspective enriched my research. It enabled participation rather than merely researching about informants and I accessed a taste of ethnography beyond merely adopting its methods and tools. Instead of entering a research arena looking for specific features (as I had originally begun), I learned to value an approach that let these come to the researcher's attention as they floated towards the surface or were cast onto the sands of the beach.

I can now reflect upon this complete journey of discovery and recognize that my approach permitted a method of enquiry that could be shaped to suit the differing contexts I entered. These were rich sites but it took time to make sense of the human experience that each contained amidst the complexities of the social world and any depth of understanding only emerged over time. My ethnographic perspective also involved recognizing my own understanding and experience as a researcher. Learning through active engagement permitted me the opportunity to mature as a researcher. It was not simply about finding an approach that best suited the purpose, but also one that suited the researcher. As Wolcott advised, novice researchers learn through participation (2010) and my research felt like an apprenticeship, learning through experience amidst those I encountered within the process. In the beginning my route was planned but it became less so as I let myself be immersed within the approach and was sometimes thrown onto a different part of the beach to the one I had left. Ultimately, however, it was about having the confidence to trust in myself, let the perspective lead and recognize that the course of ethnographic enquiry flows. It is not directed.

I discovered benefits, but also disadvantages, to the approach I had taken. One of these was its ability to let me delve below the surface of any story, yet it was never possible to cover all potential angles. The more I knew, the more I wanted to know but there was a limit to what I could expect people to reveal and the time they spent contributing. In addition; where historical context was such an important part of any understanding; it was impossible to uncover stories from all viewpoints to increase objectivity. This dilemma is illustrated by my inability to ascertain

why Nick did not continue to develop the earlier proficiencies with digital technologies he had demonstrated during his younger years. Steve and his mother had shared personal stories candidly and generously with the length of some emails indicating the considerable time they had spent on their composition. They continued to enrich their stories with details that extended my analysis. None of this would ever have been uncovered through single interviews. These contributions were invaluable, but even so, I could only ever view such stories through another's personal recollections. Yet, retelling of events are subjective because "*memories are stories that we tell ourselves*" (Yates, 2009), so I constantly needed to remind myself that researchers have to be storytellers with scepticism to all that they hear and see (Wolcott, 1994).

Fetterman wrote that ethnography involves: "*serendipity, creativity, being in the right place at the right or wrong time, a lot of hard work, and old fashioned luck*" (2010 :2), but I would add further requisites of: persistence, self belief that a story lies in the midst of surrounding chaos, patience, flexibility, people-skills and good connections; the latter being reminiscent of Heath and Street's comment: "*these colleagues opened doors*" (2008 :xii). Although my research was not located in a distant place, it sometimes felt so metaphorically. People I knew introduced me to those I did not and it was only through their generosity, that I had a story to tell. The process required determination and persistence. At times, it was enveloping and I needed to walk away both for my own benefit, but also for that of friends and family. However, it would tug me back into the roll of the next wave, entice me with a phrase, a glimmer of insight and that would be enough to make me pursue the story further. Yet the isolation of a single researcher is not for all. It made me realise that I need others around me, to talk and share my ideas with and engage with people as part of the social process of learning. Moments where such opportunities arose were invaluable.

One intriguing discovery was my reflection upon the writing practices of others made me consider my own amidst any theory of Literacy and the act of writing. I used digital technologies constantly throughout my research and particularly so during the writing process, yet most of my early analysis had nearly always occurred when I was seated in one place in my home creating handwritten text. Here, I enjoyed the sense and comfort that my surroundings provided; but I questioned why. My handwriting was an automatic skill acquired whilst young, whereas my keyboarding skills developed later in life. These became erratic if I engaged in deep thought. I wondered if this was simply because higher order cognitive skills impacted upon my skills of production and required an automaticity that I did not possess. Possibly, but there was more. I found aesthetic pleasure (and synaesthetic if considered within a theoretical concept of Multimodality) writing by hand within cloth-bound research diaries, curled up within a chair overlooking my garden. It was conducive to reflection and analysis. My words remained fixed in the same place unlike the transient nature of the text I edited on my screen. Additionally, the tranquility of looking out over a landscape seemed to engender my thinking and contributed to

my composition. It was easy to accept Wolcott's advice of writing at the same time as fieldwork (1994) because these sensory aspects contributed to my analysis and were part of *my* writing process. Yet, in complete contrast, I would never have contemplated writing these pages without the transformative mode enabled by technology. Reflection on my own experiences evoked deliberation on any concept of Literacy and literate behaviours.

At the end of my research, I can reflect upon the complete journey. I see that my study began as a piece of qualitative research. I was tentative and hesitant. I dipped a toe into the water and hopped back, ventured a little deeper on each successive visit and returned to the shore to examine what was there and what had changed. The sands around me may have shifted each time but I was always on the same beach. The early stages of my research were slow and time was spent just hanging about, pursuing what sometimes felt like fruitless avenues of enquiry but it was through those experiences that I encountered people. My research diary reminded me of this:

> *"Experience has shown that more doors seem to open if you have a name or even better an introduction to follow a lead. Life is busy but many different avenues. Some begin to develop but then go no further – others blossom and yield plenty of fruit!" (Research Diary, 27 March 2011)*

In hindsight it was not until I met Ajay and the young people upon whom I have focused, reconsidered my approach within my framework, adopted an ethnographic perspective and recognized the intermittent time mode using technology to engage in conversation, that my research really gathered momentum and meaning. This intermittent time mode of email exchange brought significant value. Single interviews may suit some types of research but mine benefitted from intermittent conversations over time. These required patience and persistence, whilst always being considerate and respectful of the time people generously offered. My research approach provided the opportunity to capture change in digital technology use as a collection of snapshots gathered over time. It culminated in a series of images that I could arrange, metaphorically, like a montage. An ethnographic perspective permitted the opportunity to immerse myself with people and within contexts that I found meaningful by considering individual personal experience that could be presented as a story. I was never merely interested in the mechanics of what users did with their digital technologies but what they thought. None of this could ever have been achieved without this timeframe or perspective.

My approach was not straightforward and one of the concerns I had in its midst was the warning that: "*To undertake ethnography is to enter willingly into a messy set of tasks that will continue over a considerable period of time among strangers that the ethnographer may inevitably betray*" (Heath and Street, 2008 :29). The process was messy and my main informants were strangers, but this sense changed over time. It was not merely a result of any continued online communication, but

their constant presence in my mind and within my writing. I could envisage individuals as I listened to their voices on recordings, read their emails again or reconsidered what I had seen or heard. Have I betrayed them? I hope not. I was always concerned about how I portrayed informants; not just in protecting their identity but how I exposed their lives in print. Some were extremely generous; not just with their time but in what they revealed and the last thing I ever wanted was for anyone to feel "betrayed." So, as I became accustomed and more comfortable with the approach I had adopted (because I had not begun with this intention), I sought to either share what I had written in an early draft or through verbal confirmation. I wanted to ensure that my informants still had the option to confirm the accuracy of my understanding, even though it risked losing valuable material if they then decided to change their minds. This was important for my own sense of responsibility and ethics, but I also drew comfort in the sense that there was some restoration of balance in that they still could exert control over what was ultimately revealed. Out of all my reflections this is probably one of the most important. The other culminated from my first conversation with Ajay when he had asked whether my research was for the sake of it or to make a difference. Originally, I had been shocked by his words but his voice remained with me. The question then influenced every subsequent encounter and, ultimately, the way that I have constructed *my* story. I felt that this was part of the transformation of data and was what Wolcott (2009) had emphasized was the importance of what researchers *did* with data rather than how they *used* it.

Finally, the ethnographic perspective I have adopted entailed framing my research differently in that I needed to consider what I could learn about a topic through discovery. My research ultimately led me to see that "*the realities of the setting exert their influence*" (Wolcott, 1994 :401). I have tried to "*keep things simple and honest*" by constantly monitoring myself within the process (ibid :402). The shift in my methodology from qualitative methods of my early singular interviews to an ethnographic perspective of dipping in and out brought that home. At the outset I had been looking for something, but the perspective led me to find it. I have learned to go with the flow, to trust the approach and its course instead of trying to steer a way through it. By doing so, I learned through the experience and discovered that not only does this enrich the research but also the researcher.

5. A Unique Contribution to Knowledge

I have already touched upon the unique contribution my research makes to knowledge in my introduction (see :17) but, as a brief summary, it lies in the construction of new knowledge regarding the use of digital technologies to support writing difficulty. My research relates not only to the practical exploration and application of technology for writing purposes but, importantly, the face of human experience behind it. It is demonstrated by the unique insight into issues of

impairment and difficulty that have been revealed through the participatory contribution of personal story and by emphasis upon specific issues that some students have faced in their educational contexts. These relate not only to their own pursuit of literacy but set amidst the expectations of others in the specific contexts in which they were situated.

6. Implications for Future Research

In my opening chapters I alluded to the scarcity of peer-reviewed research in the UK concerning the use of technologies for literacy difficulties specifically and learning difficulties more generally. Yet although research into digital technology use specifically for all stages of the writing process is necessary, it is essential for those who may be entirely dependent upon its utilisation for their communication needs.

Even the briefest of searches amidst specific software development websites or respected practitioner's published (but not academically peer-reviewed) articles, will often find a section relating to interesting case studies or details regarding the use of a particular product with a cohort of students. A tentative dip into an online forum or a casual conversation at a conference will reveal enlightening or innovative examples of use. Yet these are only indications of "*promise*", at a time when the number and variety of digital technologies are rapidly increasing but our knowledge through peer-reviewed research remains vague or out of date (Peterson-Karlan, 2011:55).

However, there are major issues with research into technology use with those with specific needs. It is not only trying to gain access to suitable sites of enquiry, the lack of any homogeneity of user, an adoption of suitable methods that might gauge the facility being researched but also isolate the focus, so that contributory factors affecting utilisation are recognised, that contribute to the problem. It is also the slow process, including publication, of the research process itself. Future research needs to involve a means to chronicle change amidst this rapidity of technology evolution but also how do we overcome the problem of what is written becoming rapidly outdated before it can be published or disseminated? As my experience with text prediction has shown, it is also difficult to examine some types of technologies, given the nature of the variables, without looking at specific products. Yet there is an increasing demand for evidence-based practice of high calibre. It is a dilemma.

The concerns that individuals with complex communication needs are at risk of literacy difficulties demands particular attention, in much the same way that those working within the dyslexia field pay attention to young children with speech and language issues. This combined with the issues raised earlier about the specific complexities of writing demand that greater attention needs to be given to research regarding the development and explicit teaching of

writing skills and not an assumption that writing will automatically develop as a result of merely having access to a digital technology device. We need to research these areas to ensure better prospects for those who might otherwise fall by the wayside.

One final, but essential consideration that is paramount to any future research is that those upon whom it centres, no matter the difficulties or limitations of achieving this, should be given the opportunity not only to inform such research, but also to participate within it. The experiences of individuals like Kate, Nick, Steve and Ajay have much to inform the world of research and education in order to help others understand how to encourage, enhance and support the experiences of younger users. This is particularly relevant as the proliferation of different types of technologies rapidly appear more accessibly, affordably and with appeal upon an open market, but the knowledge of what is most valuable remains elusive. The experiences of adults who have not grown up with such technologies illuminate an expectation of literacy and acquisition based upon previous periods. We have much to learn from listening to voices and perceptions based upon longitudinal, personal experience to be part of professional knowledge. The inclusion of parental perspective and experience, such as Steve's story illustrated, further contributes to this value.

Finally, the interest in multimodal representation that has pervaded throughout this thesis cannot be dismissed. At present research is largely disseminated through the publication of paper-based journals to small academic audiences. The process is long and protracted; therefore exploration into ways that knowledge could be made more widely available in accessible formats to a wider audience for practical application warrants further consideration.

7. Conclusion

Writing is a skill but it is also an art. Some individuals may excel, some may accomplish little more than basic proficiency and others may flounder. In schools, text production is not a separate discrete subject but embedded in almost every aspect of the curriculum. For some, the development of some digital technologies have given empowerment to partake in activities associated with communicating meaning once denied them. For others, they have offered affordance, a shift away from dependency upon others and permitted the display of capabilities and proficiency once obscured. The successful use of digital technologies may enable some individuals, but it is dependent upon external issues that relate to the physical environment, people and perceptions of literacy, social and cultural attitudes all of which contribute to whether such communication is enabled, accomplished or lies dormant. It is these factors that invoke considerations whether Disability and difficulties are exacerbated by other factors and not those of personal deficit.

Therefore, does meaning making and textual production have to prioritise monomodality? A lack of musical or artistic skill is not an issue in schooled contexts because these have not been prioritized or given the value of cultural capital. An individual's measure of self worth remains intact if he cannot paint a portrait or play a concerto, but it is not the same if he lacks competency with text. The capacity to transform language and convey meaning through text is a measure of literacy competency that our society continues not only to uphold, but measures and values. Text is still the cultural capital of our educational institutions, despite the magnitude of multimodalities that surround our everyday lives. For those who have difficulty with its production, it impacts not only upon society's measure of their worth, but also their own.

Yet, the ability to transform language across modes is beginning to become more accessible and affordable with the advent and development of some digital technologies. The experiences of some of the individuals in this research provide evidence that for some, the affordance that some digital technologies provide can help with its construction and production. Yet, access to these tools is not always possible because of lack knowledge of their existence or acceptance within schooled practices. This is not to say that digital technologies should replace pens and pencils as instruments for textual production, but that individuals should be given the opportunity to choose tools that suit their needs in the context in which they are situated.

This final chapter, therefore, concludes my research. It has combined three strands of focus to represent a unique contribution to examining digital technology use and textual production within a presentation that has transformed the most important mode, the voices of those who have experienced use. These voices have expressed not only positive experience, but also the struggle to find what production tools best suit their own specific needs in their contexts. I have presented and interpreted my key findings in ways that I feel offer an insight into the use of digital technologies and how we can make best use of the knowledge that we have today, but also considerations for knowledge that will emerge tomorrow. I have emphasized that if we are to keep up with this rapidity of change we need to find ways to capture and analyse this not only from those who are working with students, as they trial and implement emerging technologies but, and of greatest importance, the involvement of users themselves, so that research includes them and does not play mere lip service to their experience. Access to and dissemination of knowledge is an important factor and impacts upon the issues and significance of perceptions of barriers and concepts of disability and literacy difficulty. Research needs to consider these in order that we can all 'make a difference.'

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Appendices:

Appendix A:

Using an AlphaSmart 3000 with students who experience literacy difficulties

The following is extracted from one of three articles I wrote between 2004 and 2005 for publication on the website of an Australian supplier of technology, software and advisory services regarding the use of AlphaSmarts and the use of word (text) prediction (www.spectronicsinoz.com). It is included to give further insight into the implementation of text prediction on a specific device, AlphaSmart 3000 (now superseded), as it was used with students experiencing difficulties with writing. These experiences prompted my interest in text prediction use and culminated in undertaking this research.

> *"**Using an AlphaSmart 3000 with students who experience literacy difficulties***
>
> *I was recently given the opportunity to try an AlphaSmart 3000[25] with a group of students. These students, all aged 9 -13, experienced varying degrees of literacy difficulty. This particular model interested me as it seemed to offer a low cost, robust and effective tool for students with reading and spelling problems. Any kind of writing activity with them proved to be an onerous task not only due to their difficulties but also their lack of enthusiasm and stamina beyond writing more than a few lines.*
>
> *They were already making good use of a talking word processor to improve their skills but did not have any experience of predictive software. They all had reasonable keyboarding skills but could not touch type. One or two from the group made use of assistive software in their classrooms but generally it was only being used at home and in sessions with me. Those who were fortunate to have their programs at school usually shared the use of one or two desk top computers with twenty eight other students in their classroom.*

[25] Portable low cost keyboard with small screen

I was looking for a cost effective, easy to use tool which could be used whenever and wherever the student needed it. It would be essential that the student was able to use it competently and confidently before taking it into school where technical support could not be relied upon. Basically they had to be able to support themselves if they ever experienced any technical difficulties and, if necessary, be prepared to put the machine away until such time as help could be sought. In reality with a machine which seemed as simple as the AlphaSmart to operate it was hoped that these occasions would be few.

I knew a few colleagues overseas who were using these in their schools. Generally they had been bought as class sets and were available whenever their students needed them. Students who subsequently bought their own were familiar with their use and support was available. Here, the students, their parents and I were not in such an enviable position and like many other pieces of technology or software bought over the years were stepping into the "unknown". We would have to learn to become proficient users independently and I, obviously, did not want to be responsible for recommending something which would subsequently become redundant due to lack of support, usefulness etc.

So what did the students themselves make of the technology? Without exception it was greeted with enthusiasm and further requests to use it during subsequent sessions. This was encouraging as these were students who found writing onerous and had little stamina, let alone enthusiasm for written activities. The CoWriter Applet was given a huge rap (" Hey, this is cool!") Two of my "reluctant" writers had written more in a couple of minutes than their regular "ten minute" writing tasks had produced all term! They loved the way that the package was "intelligent" and could learn to use their language as it went along. They liked the way that they did not have to type everything they needed to say as the use of the word prediction required far less key strokes on their behalf and improved their sentence structure!

Even in the short number of sessions available, each student who used the software seemed to be scanning the choices of words available and actually changing the structure and content of their sentence composition independently. Each sentence was built up separately on the

screen and then transferred to the main bulk of the text on the insertion of the full stop. This factor concerned me initially but in fact it was a positive feature as the students seemed to examine the structure of each sentence and made changes before completion. Their writing was being "built" sentence by sentence which seemed to benefit the way they worked without them feeling overloaded.

A large proportion of the writing could be completed on the AlphaSmart which released the desktop for other programs. Its simplicity ensured they could concentrate on the writing task rather than the intricacies of the computer operating system. They wrote with improved content, structure and stamina and soon realized that their poor spelling was not a handicap. If they used a reasonable phonetic attempt the software would suggest a suitable word. It was terrific to see their enthusiasm and ability to construct an interesting piece of writing independently.

What were the negative features? The two main drawbacks were the comparative cost of the Applet and the lack of a sound card to provide speech feedback. The cost of the software was accepted as part of the package when the potential of the technology was recognized. However the lack of speech was a problem for the poorest reader amongst the group. Without it he could not use the word prediction accurately and therefore, at the present stage of his literacy development, was best served by other assistive technology or by using a full version of CoWriter on a desktop where speech could be supported.

So would I recommend their use? Absolutely! The AlphaSmart has enormous potential for a range of students and adults, but particularly for those with literacy difficulties provided they have a basic level of reading ability....."

See http://www.spectronicsinoz.com/article/helping-students-with-literacy-difficulties for further examples of use.

Appendix B:

Using Word Prediction with Alex and James

This extract describes some of the work with young children using text prediction technology to support their early ventures into writing (Australia, 2004 - 2005) in greater detail:

A weekly session was run for children in their early years of school entry. It was oriented towards literacy and maths and involved the use of games and other activities, one of which sometimes involved the production of text.

The children could choose for themselves, the tools they needed. Sometimes they preferred to use pens and pencils instead of technology. They liked to use the AlphaSmarts or the Clicker grids which they seemed to use as an extension of play. In fact they sometimes *played* with the words before making a selection, listening to them and changing their choices. To some, this would have been seen as an editing process but to me the overriding impression I perceived, was more one of playing with the words as if they were sounds, just as they had with some of the earlier games we had played together when they were younger. Yes, they eventually produced a piece of text that could be read and talked about but there were other actions involved between the blank screen and the final text. I felt that the children learned more about the software and were motivated to write because it was used in an open-ended fashion. Most importantly, they engaged in their writing for their own pleasure, not as a means to an end or because a task had been set. They might have started writing about their pet but it was fine when it turned into something about the fishpond next door. The whole process was about learning to create meaning within a supportive and encouraging context and, importantly, gaining pleasure from doing so.

Amongst this group of children were twin boys. One of whom had on-going speech and language difficulties which had been helped a little with speech therapy around the age of three. There were, however, underlying language issues. Had the child been in a UK school, he may possibly have been picked up through screening. Even if intervention had not been deemed necessary, he should have been monitored in the early years particularly. This had not been the case.

It was fascinating to watch these two develop over the three years that I worked with them as they differed enormously in both their confidence and ability. Nothing stopped James who was quick, bright and eager to demonstrate his abilities but Alex was much slower in his thought processes, speech and particularly empathetic to others and circumstances around him. From the very start of their involvement with me in their Kindergarten years there had been marked differences in their approaches to activities. The boys had been late entrants to the school year

having had an extra year of Kindergarten but, once in their first and then second years in school, the differences between them in literacy ability were quite marked, despite the fact that both had similar if not the same experiences. In school, Alex was coping reasonably well in comparison to his peers, but James was much more confident and making leaps and gains.

James would leap straight into a task with confidence and where written activities were concerned could create simple sentences with ease as illustrated in Figure 21 and 22. Alex did not; he needed to think more about what he needed to do, was much slower and even with use of the grids or word prediction used them with greater hesitancy. However it was his texts that were sometimes the more creative, particularly if the multimodal elements were considered rather than looking at the alphabetic text alone. Alex had the ideas in his head; they were just much harder for him to put into words, but when they appeared, they displayed a creativity that somehow found a voice (Figure 23)

One of the most important aspects that using text prediction demonstrated, was that time was needed to use it. It needed time to demonstrate how it worked, but also to allow the children to explore and find out how it worked best for them and their individual requirements. This was essential for any type of technology. However, it was not just about the application of a technology but the whole process of writing and how that could be developed and extended. With both together, the most exciting thing that was being displayed by the children was not so much a display of independence in achieving an end product, but the motivation and enjoyment they displayed towards the writing process in the short time that we had available.

Figure 18: James Creating Text

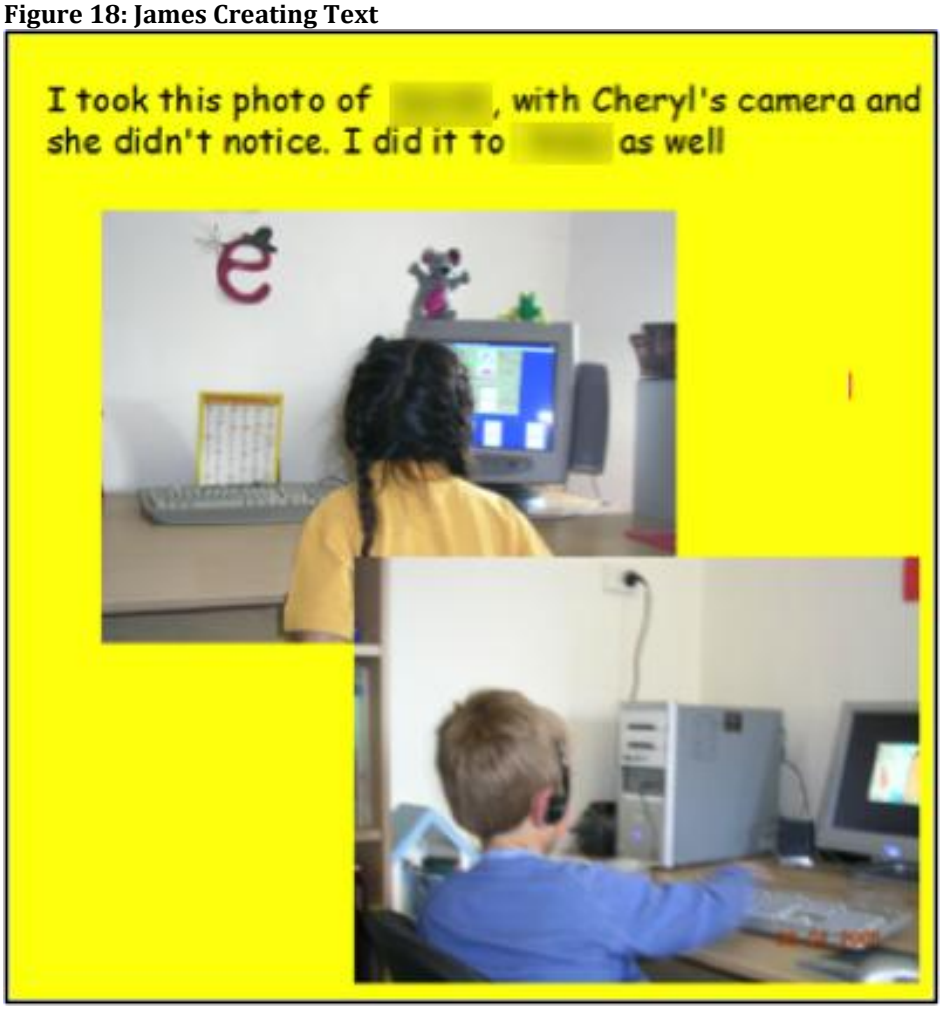
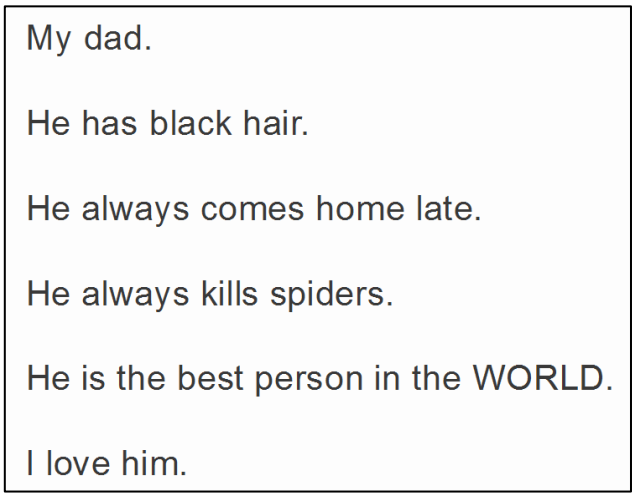


Figure 19: Alex Creating Text


My dad.

He has black hair.

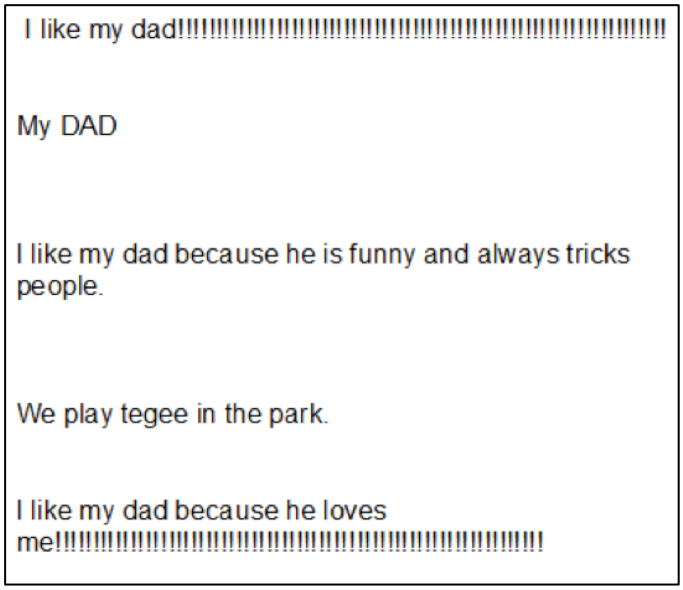
He always comes home late.

He always kills spiders.

He is the best person in the WORLD.

I love him.

Figure 20: My Dad by James


I like my dad!!!

Appendix C:

Phase One (Main Study): Information and Questionnaire distributed to Participants

The use of word prediction and its implications for emergent literacy practices (REP(EM)/09/10-2)

Thank you for agreeing to participate in this post graduate research project which is designed to look at the way in which word prediction software has been used or trialled to support students with written activities. It has particular focus upon the reasons why word prediction software was chosen for specific students and the contexts and conditions which affect this use.

All returned questionnaires will be treated confidentially and allocated a unique code to retain anonymity.

Please record your responses in the box provided on the right of each question. These can be inserted directly into the form.

N.B. This questionnaire forms the first part of a two phase approach to the research project. If you are willing to participate or contribute to the second phase, you are invited to provide contact details in Question 12. However, if you do not wish to contribute further, your details are not required.

When completed please return this form as soon as possible to:

cheryl.dobbs@kcl.ac.uk

Thank you

What is/was the age of the eldest and youngest student using this type of software?	
Over what period of time do/did most students use word prediction?	
Why is/was word prediction used with these student(s)?	
What word prediction software is/was used?	
Please give some examples of the type of writing activities word prediction software is/was used for.	
What have these students gained from using word prediction?	
Do/did you ever adapt, modify or change any settings to use word prediction?	
Please describe any difficulties experienced using word prediction with students?	
Approximately how many students use/used such software?	
Please give some indication of type and size of establishment(s) if applicable. e.g. primary school/ approximately 360 students	
Have you any experience or thoughts about using word prediction with younger children?	

May I contact you to find out more about your use of word prediction software with students? If you answer Yes to this question, please provide contact details which will be removed from this questionnaire and stored separately. You will then be contacted for the second phase of this project at a later date.	
Do you have any other comments or experiences to add which you feel would contribute to this research?	

Thank you for taking the time to contribute to this study.

N.B.: You are still free to withdraw any data you have submitted, up until two weeks after receipt of the completed questionnaire, and without any need to give a reason.

Appendix D:

Phase Two: (Main Study) Information Sheet for Participants

INFORMATION SHEET FOR PARTICIPANTS
Interview Only (Adult Participants)
REC Protocol Number: REP(EM)/09/10-18
Title of study: The use of word prediction and its implications for literacy practice

Thank you for considering taking part in this research project which aims to investigate the reasons why word prediction software is used with students for writing activities and the contexts and conditions which affect this use.

I have enclosed some information about the project to help you decide whether to participate in this part of the study.

Who is being recruited:
A selection of people who represent different groups involved with the either the use, or distribution of word prediction, with students are being asked to help with this research.
These include:

- teachers and others who help students to use the software and may be based in schools, peripatetic services or act as private tutors
- members of advisory services who suggest the use of different types of software but are not involved with the practical application with the student directly
- developers and distributors of this type of software
- students who use the software for writing purposes

It is not intended that participants only represent those who use this type of software regularly. I am equally interested to hear the views of those who have tried this software but have not continued with its use for whatever reasons.

Participation involves:
If you agree to take part you will be asked to sign the consent form at the bottom of this information sheet. An interview will take place at a time which is convenient for you at your place of work e.g. school or offices. If this is not convenient, the interview can be conducted by telephone.

If you think your *school* would be willing to become involved, arrangements will be made to contact your Head Teacher to discuss the possibility of pupils being observed using the software and to ask for their views. This will be conducted through focus group interviews with a maximum of six pupils in each group.

What will happen with the information collected:

With your permission all interviews will be digitally recorded. These will then be transcribed and the recording deleted. If students are observed using the software, field notes will also be taken. At no time will your name, the names of students or the school be used in any subsequent report.

All transcriptions and field notes will be treated confidentially. These will be allocated a unique code and pseudonym to retain anonymity and stored electronically on a private computer. This data will be destroyed one year after the completion of the project.

Risks:
It is entirely at your own discretion whether you participate in this project. There are no risks involved and all data will be treated confidentially. This data will be destroyed one year after the completion of the project.

If after having taken part, you subsequently change your mind, you are still free to withdraw any data you have submitted, without any need to give a reason, up until three weeks after the interview and/or observations have taken place.

Benefits of the research:
The final report will summarise the findings from a range of different perspectives and will be available in the library at Kings College, London (Waterloo Campus).

It may also be shared with the wider research community to help others with an interest in the use of word prediction. All names of staff, pupils and school will remain anonymous in any publication.

Contact details:
If you have any questions or require further details, please email me on cheryl.dobbs@kcl.ac.uk .

Thank you.

Cheryl Dobbs
Researcher, Kings College (London)
If this study has harmed you in any way you can contact King's College London for further advice and information: Chris Abbott via email *chris.abbott@kcl.ac.uk*

This project fully complies with the Data Protection Act 1998 (DPA).

Appendix E:

Consent Form for Participants

Consent Form For Participants In Research Studies

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: The use of word prediction and its implications for literacy practices
King's College Research Ethics Committee Ref: *REP(EM)/09/10-18*

Thank you for considering taking part in this research. The person organizing the research must explain the project to you before you agree to take part.

If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

I understand that if I decide at any time during the research that I no longer wish to participate in this project, I can notify the researchers involved and withdraw from it immediately without giving any reason. Furthermore, I understand that I will be able to withdraw my data up to three weeks after the date of interview.

I consent to the processing of my personal information for the purposes explained to me. I understand that such information will be treated in accordance with the terms of the Data Protection Act 1998.

Participant's Statement:

I _____

agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.

Investigator's Statement:
I, Cheryl Dobbs, confirm that I have carefully explained the nature, demands and any foreseeable risks (where applicable) of the proposed research to the participant.
Signed: Date:

Appendix F:

Letter given to Parents of Children (Parents of Pupils in Primary schools)

Dear Parents,

I am a researcher at Kings College London from the Department of Education and am working on a project entitled: **The use of word prediction and its implications for literacy practice.**

In your child's school, some of the children use word prediction software to help them with their writing. I am visiting different schools that use this type of software to see it in use and to find out more about what the children and their teachers think about it. Your child's school has agreed to take part in this research.

I will be observing and talking to the children about the way they use this software to help them with their writing. Your child may be asked to help further by taking part in an interview with others in a small group.

I will be making notes about the way that the software is used and tape recording the interviews with the children so that I can take notes from these later. The children's names will not be used in these notes and the recordings will be then be deleted.

At the end of the project I will be writing a report which will be shared with other schools and researchers to think about some of the issues which are involved when using word prediction with children. Your child's name and the name of this school will be not be used at any time in this report.

If you agree that your child can take part in this research project please complete the consent form below and return it to the school office by *(insert date).* You can still withdraw your child from the project, up until three weeks after your child has taken part, if you later decide to change your mind.

Thank you

Cheryl Dobbs

Researcher, Kings College (London)

Please complete and return this tear off slip to Cheryl Dobbs, c/o the school office by [add date]

Research Project: The use of word prediction and its implications for literacy practice.

Name of child: _____

I give consent for my child to be involved in the above research project.

I **do not** give consent for my child to be involved in the above research project.

Please delete as appropriate

Signature of Parent / Guardian _____ Date _____

Appendix G:

Letter given to Parents of Children (Parents of Pupils in Secondary schools)

Dear Parents,

I am a researcher from the Department of Education at Kings College London and am working on a project entitled: **The use of word prediction and its implications for literacy practice.**

I am visiting different schools that use word prediction software to help pupils with their writing. Your child's school has agreed to take part in this research and to let me see this type of software in use and to find out more about what the pupils and their teachers think about it.

I will be observing and talking to pupils about the way they use this software to help them with their writing. Your son/daughter may be asked to take part in an interview with others in a small group.

I will be making notes about the way that the software is used and tape recording the interviews so that I can take notes from these later. Pupils' names will not be used in these notes and the recordings will then be deleted.

At the end of the project I will be writing a report which will be shared with other schools and researchers to think about some of the issues which are involved when using word prediction with pupils. Individual names and the name of this school will be not be used at any time in this report.

If you agree that your son/daughter can take part in this research project please complete the consent form below and return it to the school office by *(insert date)*. You can still withdraw from the project, up until three weeks after your child has taken part, if you later decide to change your mind.

Thank you

Cheryl Dobbs

Researcher, Kings College (London)

Please complete and return this tear off slip to Cheryl Dobbs, c/o the school office by [add date]

Research Project: The use of word prediction and its implications for literacy practice.

Name of Pupil: _____

I give consent for my child to be involved in the above research project.

I **do not** give consent for my child to be involved in the above research project.

Please delete as appropriate

Signature of Parent / Guardian _____ Date _____

Appendix H:

Letter given to Head Teacher of Targeted Participating School

Dear (Name of Head Teacher to be inserted)

I am a researcher at Kings College London and am conducting a study entitled:
The use of word prediction and its implications for literacy practice.

I am writing to invite you to take part in this study as I understand from *(name of teacher who has agreed to continue involvement)* that your school uses word prediction software to support the writing activities of pupils in the *(to be inserted)* age range.

The study aims to explore some of the issues which relate to the use of word prediction software when it is used to support the writing process and the way its use affects those activities from both the pupil and teacher's perspective. Additional perspectives from developers and literacy/software support staff, as well as pupils and staff in other schools, have also been considered in a separate part of the study.

The research project in your school would involve:

A visit to your school to see the software being used with pupils
An interview with (name of teacher)
A focus group interview with a maximum of six pupils

Observations would be recorded using field notes and the interviews would be digitally recorded. These recordings will then be transcribed and the recordings destroyed.

All names of staff, pupils and school will remain anonymous in the final report. This will summarise the findings from a range of different perspectives and will be available in the library at Kings College, (Waterloo Campus). The findings in this report may also be shared with the wider research community to help others with an interest in the use of word prediction.

I do hope that you will be willing to participate in this research. I can be reached by email on cheryl.dobbs@kcl.ac.uk if you have any immediate queries but will telephone you next week to discuss the project further and to find out if you would like your school to be involved.
Yours sincerely

Cheryl Dobbs
Researcher Kings College (London)

Appendix I:

Information Sheet given to Students and read with them

.

Title of Study: The use of word prediction and its implications for literacy practice.

Your teacher has told me that you sometimes use word prediction software (*or name used by child*) when you write. I would like to ask you for some help with a project that I am working on but it is entirely up to you whether you decide to take part or not.

This is what will happen:

I will watch how you use *(name used by child)* and ask you to tell me about the way it works for you. I will ask you for your ideas about what it is you like or perhaps don't like about the software, what it helps you to do or what you wished it did differently. We will talk about this in a small group with others who also use it.

I will take some notes which will help me to remember what you do. I will also record the conversations we have in our group so that I can listen to these later. I will delete these recordings when I have finished adding some of the ideas to my notes.

The information you help me to collect will be used to write a report. However, I will not use your real name or the name of your school in it.

This report will then be used to help other pupils and their teachers learn how to use this software with their writing.

If you later decide that you do not want your comments to be included in the study, please tell me or your teacher. You can do this up until two weeks after we have talked together.

I hope you will be willing to help.

Thank you

Cheryl Dobbs
Researcher, Kings College (London)

Appendix J:
Example of Participation Request sent to Forums

Word Prediction Software:

If you use, or have ever tried to use, word prediction software with students, would you be willing to take part in a post graduate research project being conducted at Kings College, London?

It aims to look at the uses for word prediction software and is investigating the different reasons why it is considered for specific students and their writing activities.

I am trying to contact those who work with existing users or who have used the software successfully in the past. However, I am also interested to hear from anyone who may have trialled word prediction with students but have not continued with its use for whatever reason.

If you would be willing to help by completing a short questionnaire, please email me on cheryl.dobbs@kcl.ac.uk

Thank you for any help you can give and apologies for cross posting across forums

Cheryl Dobbs

Appendix K:

Interview Themes for semi-structured interviews:

<u>Interviews with Facilitators:</u>

Length of time that word prediction software has been used.

Age and needs of students with whom it is used e.g. length of time being used.

Type of word prediction software used and the reasons for that choice.

Criteria for use e.g. why and for what purposes.

Has the teacher had previous experience of word prediction in other situations?

Is it effective – what are the positives?

Were any difficulties encountered with its implementation? Look for examples.

Are there any visible changes in attitudes of students towards writing activities when using it?

If the software is being used effectively – reasons why this was so e.g. contextual issues, actions by others to ensure software worked.

For whom would the software be seen as useful?

Has it been successful with all students who have been introduced to it? If not possible reasons?

Is it used outside of classroom?

Changes? Improvements? – related to software itself and context

Could it be used with other students e.g. younger or across other ability ranges?

Interview Themes: Students

How long they have been using word prediction?

Why do they use it and what do they use it for?

Any changes to their writing behaviour/attitude?

What is it about its use that they find useful?

What features do they like/dislike?

Do they need to set it up in a particular way e.g. location of prediction panel, use of speech?

Is it used outside of classroom?

Changes? Improvements? – related to software itself and context
Would it help others /should others use it.

Interview Themes: Interviews with Developers/Distributors

Perception of the range of use and attitudes towards the use of text prediction in the UK.

Market for whom software is targeted.

Examples of who/where the software is *actually* purchased/used – context, age range etc.

Perceptions of the range of its use in schools e.g. limited, widespread, growing/stagnant – possible reasons for this.

Software has changed, improved e.g. phonetic spelling, speech support– is this changing perception?

Potential market for whom software would be useful – does this differ i.e. are their users that are not reached – reasons for this?

Contextual issues which affect/prohibit its use.

Contextual issues for successful implementation.

Possible reasons why Word prediction is not used more widely.

If the target has been learning difficulties – is there potential for its use with wider range of users e.g. emergent literacy?

Appendix L

Table outlining the issues that led to considerations and adaptations of questionnaire (Phase One)

Table 10: Issues and Considerations Leading to Adaptations of Questionnaire (Phase One)

Issue Topic	**Outline of Issue**	**Change Adopted**
Terminology	The questionnaire used the term word prediction. Responses to the Pilot Study indicate use of the grid-based prediction, Clicker - a type of prediction where specific word banks or grids of words are created for the student to use but not generated by the software itself. This needs to be considered separately from other technologies associated with the use of lexical prediction generated by algorithm. Do grid based systems represent prediction? This represents the dilemma of trying to create a standard questionnaire to target participants who are drawn from very different backgrounds and experience. Decide whether to be specific about types of products considered or at least add the term word banks and grids to word prediction software in the outline information. One respondent has included it – would others?	Use <u>text prediction</u> to cover all types of predictive text. Use <u>grid based</u> for Clicker or its name.

	It is impossible to cover all eventualities in one questionnaire without widening the scope of the study to unmanageable levels. Comments that confirm the inclusion of interviews as the only way to be sure of certain contextual issues. Illustrated by: *"Have responded to the questionnaire but don't really think there is much I can help with - I used Clicker with another consultant about 4 years ago and haven't had much call to use it since – it is a very underused resource in our schools! The software I think is hard to use and gets in the way of the learning and I suspect isn't quite what you are looking for"* (Sam, email, 25.11.09) This reference to the resource being "*underused*" and "*gets in the way of learning*" was not found in any response on the completed questionnaire, only in the accompanying email. This could obviously be pursued in a follow up interview, but its exclusion from the actual questionnaire reinforces the necessity for opportunities to explore issues through interviews and not reliance upon questionnaire responses.	
Text prediction on mobile phones	Another email question: am I including mobile phone text prediction in my consideration? (At this stage in the research the disambiguation process of letters assigned to number keys on the numeric keypad as discussed in Chapter 2 was used.) <N.B. Smartphones were not widely in use when this questionnaire was distributed> It was not included in the original questionnaire (or focus) because original plans had leaned towards word prediction use with younger children and, at that point in time (2009), they did not generally use mobile phones.	Text prediction on any device to be included

Role of respondent	The respondent's role was not sought on the original questionnaire or how long they had been using such software with students. This needs consideration since it would have an impact upon perception and experience. However, there is a need to keep the questionnaire simple and quick to complete - follow up in interviews.	Not added to questionnaire but a question to be asked in interviews
Tense of question	The tense of the questions – a late implementation in order that a retired colleague could be used. If questions are only phrased towards existing users, this will preclude anyone who might have once used the software and who might assume that their experiences are not valid. This is not the case. However, it presents issues with how to deal with the evolvement of software.	Past tense to be used on questionnaire. Allocate categories to software – will not solve all issues though.
Focus upon successful use	It has become increasingly apparent, and a concern, that the study is being perceived as only targeting users who are successful with word prediction implementation. Two participants have explained (by email) that they have tried the software with a student, had not found it easy to use, therefore, have not pursued it further. They feel they are not suitable informants for the questionnaire and could add little value to my research. Yet, this is precisely the sort of information that is extremely valuable. They are suggesting contextual issues that affect use that would not come to light if participants felt that the questionnaire was only looking for positive histories.	Ensure this is clear in email conversations or requests for recruitment.

	It is essential that any recruitment information, accompanying email and information sheet make it fundamentally clear that the research is targeted towards anyone who has tried, used or is still using prediction software regardless of success or lack of it. There is much to be learned from those who were deterred from its use.	
Student participation in questionnaire phase	Do I want student responses to this phase? Consciously trying to target those who might be using the software with younger students. The questionnaire was deliberately worded towards professionals implementing its use. This participant has volunteered an adult student who has begun to use the software, yet the design of the questionnaire has not been intended for student completion. Should I adapt the questions to accommodate this should it arise again? No - desist, a decision based purely upon keeping the study manageable and aimed at trying to locate gatekeepers working with younger users. Students' perceptions and experiences would best be sought through interviews or focus groups rather than the use of a questionnaire and written responses.	No student responses to questionnaires
Software recommended but not actually used	One of the potential pilot participants felt that the questionnaire could not be completed as although she had recommended the technology for many years in her consultancy and support role, she had never actually used it with students herself. This response warranted consideration about recommendation of software by third parties who do not ultimately	Keep email contact open

	become involved in its implementation. Again, participant willing to contribute with an interview but this information was only gleaned from our dialogue through email and not the result of completing a questionnaire. Yet again - difficulty of targeting the recruitment of potential participants and exploring the variety of their experiences through one simplistic questionnaire. It is essential that the wording used in any literature relating to the recruitment of participants is flexible enough to accommodate all potential participants and encourages them to contribute. I do not want to lose valuable sources because others might dismiss the relevancy of their experience because of the oversimplification of a questionnaire.	
Age of software	Other useful information relating to practical issues in the analysis of responses based on information regarding use of older word prediction software packages such as early versions that lacked the speech support that present versions now have. Later versions of word prediction software provided many additional functions including a facility for speaking not only the words in the predictive panel but also the sentence into which it is inserted. One respondent mentioned difficulties that applied to an earlier version and raised the issue related to dealing with responses that linked with the changes in development of the software. This same participant expressed the concern that her responses might be irrelevant because of the date of her experience:	Categorise software – but there will still be an issue

	"Yes but bear in mind that this was some years ago now and my experience may be less than useful". (Rita, Questionnaire, 25.11.2009) This type of experience is potentially useful. This participant is still well respected in the field of literacy support by other professionals and although retired from a professional role, still contributes actively in the field. It is also valid since it draws attention to perceptions of value and use of specific software. Interesting views on word prediction use based upon considerations of early research that uses older versions of software with less functions and capabilities than those available today. Links to Literature Review citing as references that relate to older software with less functionality and still have an impact upon perceptions of efficacy, by some people today.	
Timing	Issues with distributing a questionnaire in latter part of terms. Give thought to when it is distributed	Try for early Spring Term

Appendix M: Summary of issues and emerging themes from Pilot Interviews (A and B)

Table 11: Emerging Issues and Themes from Pilot Interviews A and B (Phase Two)

Question/ Theme	**Karen (Interview A)**	**Comment**	**Sally (interview B)**	**Comment**
Who used it? Where?	Higher Education setting e.g. Sara ten years before	assorted	10 year old boy (Henry) Tutored out of school	one student
Why was it used?	Sara – physical disability (example of successful use) – previous attempts to use speech recognition had been unsuccessful. Others – mainly physical disability, low energy levels Not dyslexia specific through allocation of Disabled Students Allowance. Most students Karen showed this to did not realise it was on their Category 1 software. *"Of the thirty, forty students that I've seen in the last two years who have all been assessed all had*	Physical Impairment Fatigue Available to students with dyslexia but not aware it is in allocated software University first supported encounter	Writing Issues: *"I was shown something that he had done and I could see where the problem was. Initially I thought, has he got the skills to write anything down? His spelling was poor, his punctuation was non-existent his use of vocab varied enormously from lots of sight words that he knew most of, not all, but also some words which were very much longer and, to <u>me</u>, utterly indecipherable". (Sally, Interview, 2010)* Henry could not read own written text	Literacy Difficulty Reading and writing issues

	assistive technologies, not one of those dyslexic students was using it" (Karen, Interview, 2010) Not introduced until University generally: *"some may have been introduced to it as a learning resource in their school on a limited basis without support"*			
What was it used for?	Vocabulary support and extension			
Training and Support	*Sara was helped and shown how to filter out the inaccuracies and to set up a subject specific word bank suited to the vocabulary she required and, importantly, at the adult level at which she functioned.* *"Very often what I think people don't realise is of course that you can build your own vocabularies so you can make them subject specific and of course several of the companies provide you with word lists even so that your word prediction almost becomes a word bank and in her case that's how she used it and it was immensely helpful for the longer words because invariably it*	Potential for vocabulary use/support/extension for higher education. Level of support available In this scenario it seemed that the prediction of the more complex vocabulary that Sara required for	Had no training in use – thought companies could provide it: *"Yes they could give you sample software so that you could actually use it for a bit and become familiar with it and be sufficiently familiar with it to be able to show the parents and the children involved to show, to let the children play with it too because when they become familiar with it they are going to become far more confident and that's where success is. You can't do it without confidence". (Sally, Interview, 2010)*	Awareness of training (Sally's idea of a training model -is this feasible? Would a demo be sufficient?) Where would she get access to get good training – not universally available?

	worked better with the longer words than it did with the very short words" (Karen, interview, 2010). *"I think one of the issues we have with word prediction is that we are not training for it so we just give the program expect the student to use it and it's not tailored to their needs it's not even specific to their subject that they are working on" (Karen, Interview, 2010)* *"The other side of it is all is when I was talking to the student and I think this is true of many dyslexic students they somehow feel that if they've got this technology it's got to be used in a blanket fashion they should use it for <u>every</u> single piece of work they do* *They are <u>told</u> that well maybe that's the case maybe that is when it should help them but actually, very often, there are times when it is inappropriate and you know it's not going to help to help them" (Karen, Interview, 2010)*	her studies worked the most accurately out of the predictions that were offered and gave her the greatest support with her writing. However in order to reach this level of functioning, Sarah was given a great deal of support by the university, much more than would usually be representative. Lack of training (but not only text prediction) – not just for student by teachers, trainers themselves etc General comment about technology they were allocated under		

		DSA.		
Typing and Keyboard proficiency	Sara – slow typist (physical impairment). Text prediction helped her to get to 25 words per minute. *"It may be that they give up using it because their typing is too quick and I think one of the things that also might be having an impact on on its lack of use is the fact that I would have said that 80% of those students were good typists and probably perhaps even higher." (Karen, interview, 2010)* Another example: word prediction had not only inhibited the speed of text construction but had caused distraction. *"In fact I had a student in <u>yesterday</u> a 20 year old saying I can't stand it it distracts me and I want to turn all these things off. I want to choose when I have it and she was talking about both word prediction <u>and</u> spell checking (Karen, interview, 2010)*	Useful for slower typists/keyboard entry but not for those who are more proficient. the rapidity of typing speed would render the software ineffective. To make full use of the words offered in the predictive pane, proficient typists would need to reduce their typing speed to view these - the software functioned by changing the words on display according to the keys being pressed. Since these students	*"You've got to have keys on the end of your fingers" (Sally, interview, 2010)*	Keyboarding or typing skills? Speed Efficacy

		were already typing rapidly, the predictive pane would be constantly changing and basically ineffective.		
Who makes the choice?	Student	But all were over 18 and could choose for themselves Autonomy	Sally (for Henry to try)– as a result of a professional development presentation and influenced by a colleague who was using it successfully and enthusiastically.	The adult – in schools do children get a choice?
Issues	*"This is something people don't realise that if you constantly use the prediction inaccurately, it will remember your inaccuracies"* (Karen, Interview, 2010) For some students it is a distraction: *"One of the times maybe when they are <u>creating</u> text and they're trying to think of what they are going to write and as this girl said if you have too many distractions on that you actually don't get anything down." (Karen, Interview, 2010)*	As developers sought new ways of improving word prediction use, the ability for the program to learn words as it was used, had been introduced. This facility to learn new vocabulary also meant that the software had the	Unsuccessful attempt – guessed at suitable dictionary. Child had to write about Autumn for school homework: *"I didn't have as much time to play with it as I should have done and that was where the calamity came because I wasn't sufficiently used to it " (Sally, Interview, 2010)*	Henry did not have vocabulary for the topic of Autumn. Was he motivated to write? Sally used it as "plug and play" did not explore use before attempting to use with

		potential to incorporate words that had been inaccurately entered either by spelling or typing error. In order to function accurately and efficiently, this needed counteracting and required regular housekeeping so that these could be reviewed and removed if necessary. Without this regular monitoring, by a third party if necessary, the software was unable to function efficiently and accurately.		student.
Factors affecting choice	Some Category 1 technologies are now too complex and that in some ways a return to the concept of older and simpler packages offered	Some have become so complex that their efficacy has been lost.	*"I would certainly use it again but I would need to work on all of the things first and of course there is the problem of paying for it" (Sally, Interview, 2010)*	Is cost a deterrent? Who pays? Parent? School?

	greater support for some students.			
A writing tool	*"Unless you had a very, very poor knowledge of vocabulary I felt it sometimes slowed students down. They were busy looking for a word that they didn't necessarily know what they were looking for and if they had got it set at a different part of the screen they were distracted from the writing line so that so that it was it was was time off writing." (Karen, Interview, 2010)* *"And the other thing I would say about word prediction is if you are going to use it and you are only going to use it as a word finding you know because you can't think what the next word should be don't present ten words."* *I think this is one of the other problems that when the list drops down many of the students can't make the choice. The list is too long. They can't necessarily read all the words and then when*	Position of the predictive pane - alongside typed text it potentially added to the distractions affecting the student and slowed the writing process down even further. Yet if it was positioned in the top left hand corner of the screen, the student's attention was diverted from the writing line. Most useful predictions needed to be located in the top three positions if they were to be effective. However this assumed		

	they've used all the speech so they have delayed themselves further and then <u>really</u> what they doing is needing to focus on those top three and we know that's one of the issues with spell checking and I think the same applies to word prediction. (Karen, interview, 2010)	that the student was able to recognize (read) the word that was required from those suggested. If further support was needed, such as the need to have the word spoken,		
Access and Opportunity			*"Yes very used to computers has his own laptop uses it a lot of the time he's a bit dyspraxic anyway and very much happier using the computer". (Sally, Interview, 2010)* Did he use it in school? "*Sometimes not all the time".*	Yet Henry did not appear to be able to use the computer regularly *in* school
Attitudes to technology			Henry felt he would only be given the opportunity to use *extra* technology in school if there was an issue or to address a difficulty. Worryingly, it appeared that he felt that using software like prediction technology was something to be kept hidden. It needed to be secretive so that nobody *"would know."*	Concepts of self preservation, not wanting to appear "different" to peers.

Awareness of text prediction	Confusion Lack of research People just did not know what its purpose was or the best time to introduce it e.g. DSA assessors were left without any clear guidance. Lack of products to work in an online environment			

Pilot Study Interviews A and B(Phase Two)

The themes that emerged from an analysis of both interviews have been tabulated above and given a brief consideration of the issues raised. Sally and Karen held very different experiences with text prediction use and so this affected their viewpoints. As a private tutor, Sally's experience was restricted to a trial of one product on one occasion with one student. It had not been a success; not necessarily because of the functions of the utility itself, but as she realised because she had not known how to set up and use the software effectively. Contributing to this, the student had experienced difficulty (and lack of motivation) with the topic he had been asked to write about. The process was more complicated than she had envisaged and so the student's first encounter with text prediction use was unproductive. In contrast, Karen's more diverse experience with digital technologies and the number and range of students she had used them with, gave her greater experience from which to draw insight. Yet, both informants offered important contextual considerations and raised specific issues regarding use, perception and experience.

Karen drew upon her experience with students in a university setting using a specific illustration of use with a student with a physical impairment who, with considerable support, had used text prediction effectively a number of years ago. More recent experience was based upon students in receipt of the Disabled Students' Allowance (DSA) who had access to the utility within the support software packages they had been allocated (Category 1). However, some of these students did not realise that it was one of the facilities available to them within the software they had loaded onto their digital technologies and did not access it.

Other students had tried but had abandoned use when they found it distracting. However Karen also felt there was a general reluctance to use any new facility that required setting up before starting the writing process with some. Time pressures also precluded use when some students did not want to set aside additional time to learn how to use new software when faced with assignments. However, even those who used text prediction did not use it in any online writing environments when the activity was set for an academic purpose. Instead they relied upon online tools, (such as online spell checkers, facilities that Karen felt were not always reliable) or just did without. In her view there were only specific types of students who used text prediction or other assistive technologies on a regular basis:

> *"The only people who use assistive technologies in those circumstances are those who really desperately need them so visual impairment and motor disabilities then you'll be using it" (Karen, Interview, 2010)*

Karen also expressed concern that some of the text prediction tools that students used with a word processor were unable to function in their online environments, but this was not necessarily made obvious either by those that recommended the packages initially or the software developers themselves.

> *"I think we are missing the point sometimes that our students have moved straight into the online community now. All their research is online. Everything's online. A lot of assessors realise this but what they don't, what we're not doing, realise - Is chasing up the assistive technologies that work with the online situation. I think the problem is the assistive technology isn't necessarily very adaptable for the online world at the moment." (ibid).*

This interview also highlighted the dilemma that online tools, such as spellcheckers, were beginning to emerge whereas online text prediction software had not:

> *"when you are online or do you stick with these enormous programs like *** that have everything all in one tool bar and be honest about them and say well they don't work in some of the programs." (ibid).*

In Karen's opinion, text prediction had become stagnant within new written practices in online working environments despite the fact that these were the very environments in which many of the students were involved. She had concluded this theme with a worrying message:

> *"And in which case you are limiting your disabled user to those programs with which they work." (ibid).*

Her implication was that some of the tools with which students were being issued were almost redundant before they had come out of the box. However, and perhaps disturbingly of all, the concern that those students who needed them most, were then excluded from certain writing environments, like the online activities that were part of academic practice. Karen also emphasized that, in her experience, most of the students she came into contact with only received these types of digital technologies once they had reached university.

Both interviews raised specific issues. The first was whether digital technologies could have been trialled and used earlier in educational environments (schools). This prompted the consideration concerning when they could be more productively introduced; that is before more complex written practices were required and when the expectation of written text production had increased. This was a theme that would rise again in subsequent interviews particularly with those who worked with students in schools. It linked to my research questions but also contrasted with what was considered and with what actually occurred. When was or could assistive technology be introduced and best utilized? If students were not being given the opportunity to explore assistive technology until they reached University, was this too late? The interview with Karen had also considered those students who had been given the facility but had chosen not to use it. However, it also illustrated the concern that some students did not experience any opportunity to access specific technologies unless they continued on to university and fulfilled the requirements of eligibility for access to the financial support of the DSA. These were important issues regarding awareness and access for those unlikely or unable to move into Higher Education.

Both participants' perceptions of word prediction software were based upon one of benefit and namely of compensating for writing difficulty. In Sally's case this was associated with increasing self-confidence and motivation, whilst improving vocabulary and legibility. Karen was far more cautious and apart from considering

its use for physical issues, provision of vocabulary extension seemed to be the overriding factor. Karen's interview also provided an extensive range of themes regarding digital technologies to consider and pursue. Although she expressed negative views on the use of text prediction itself, this was more to do with the fact that she felt there was confusion and a lack of understanding over what it was best placed to do and for whom. In her experience it had been used as the only option because speech recognition was either too expensive for most students to purchase, were unable to use because of its stage in development or because of their own speech issues.

Both interviews highlighted a lack of awareness in what the text prediction could be used for and how it could be used. The interview with Sally also illustrated a lack of access to options where she could explore different types of supportive software for those like her who were only just beginning to become aware of its existence for students. The interview with Karen illustrated that although text prediction software was more widely available in Higher Education settings, it was not necessarily used. However, of greater significance was the changing nature of the literacy practices of the students with whom she worked and their move into online working environments where it appeared that present software was not always able to operate, rendering the application virtually redundant if it could not function within web browsers. It remained to be seen whether these perspectives were reflected in any further interviews when I moved into interviewing informants within the Main Study itself.

Appendix N: Summary of Participants Involved in Research (Phase One and Two)

Name	Gender	Age focus	Role (main)	Type of Participation	Perspective in Framework	Involved in Pilot Studies
Phase One						
Sal	F	Primary/Secondary	Peripatetic Support Teacher	Q	Facilitator	*
Keira	F	Primary	Peripatetic Support Teacher	Q	Facilitator	*
Tanya	F	Primary/Secondary	Support Teacher	Q	Facilitator	*
Karen	F	Secondary/Tertiary	Assistive Tech Advisor	Q/I	Facilitator	*
Sally	F	Primary	Private Tutor	Q/I	Facilitator	*
Phase Two						
Adele	F	Primary/Secondary	Advisory Teacher LEA	TMI	Facilitator	
Ellen	F	Primary/Secondary	Senior Advisor	Q	Facilitator	
Gavin	M	All ages	Assistive Tech Charity	Q/I	Facilitator	
Angela	F	Primary/Secondary	Senior Advisor	I	Facilitator	
Pam	F	Primary/Secondary	Senior Advisor	Q/I	Facilitator	
Karen	F	Primary/Secondary	Support Service	Q/TMI	Facilitator	
Sarah	F	Primary/Secondary	Technology Centre	I	Facilitator	
Toni	F	Primary/Secondary	Advisory Service and Support Teacher	I	Facilitator	
Mary	F	Primary	Teaching Assistant	I	Facilitator	
Cara	F	Primary	Advisory Teacher LEA	TMI	Facilitator	
Lois	F	Primary/Secondary	Advisory Teacher LEA	TMI	Facilitator	
Annie	F		Parent	TMI	Facilitator	
Carole	F	All ages	Charity	TMI	Facilitator	
Nigel	M	Primary/Secondary	Deputy Head	TMI	Facilitator	
Jan	F	Primary/Secondary	Advisory Teacher	I	Facilitator	

Paul	M	Primary/Secondary	LEA Advisor	I	Facilitator	
Steven	M	All ages	Distributor	I	Distributor	
Colin	M	All ages	Distributor	I	Distributor	
Gary	M	All ages	Developer	I	Developer	
Helen	F	All ages	Developer	I	Developer	
Amar	M	All ages	Developer	I	Developer	
Ajay	M		Post Grad Student	I/TMI	User	*
Steve	M		University Student	TMI	User	
Nick	M		Secondary Student	I/TMI	User	
Kate	F		Primary Student	I	User	
	F		Primary Student	Observation	User	
	F		Primary Student	Observation	User	
	M		Primary Student	Observation	User	
	M		Primary Student	Observation	User	

Figure 17: Summary of Participants Involved in Research (Phase One and Phase Two)

Key: M – male, F – female, Q – questionnaire, I - interview, TMI – technology-mediated interview, LEA – Local Education Authority.

Appendix O:

Phase One Pilot Study A

Table 12: Matrix comparing Questionnaire Responses: Phase One Pilot Study

Number using software:	2	210	50	1	n/a
Type of establishment:	Higher Education	Primary school	Primary and secondary schools		Primary and secondary
Age range of student(s) using software:	21-23	5-11	9-16	10.3	8-18+
Period of time software was used	Intermittent but ever since student had access to computers	Half Term Project	Varied e.g. from first experience/ throughout schooling/short term	1 session trial	Varies from 3 months to 2-3 years
Software Type	Category 1 Onscreen keyboard/ Switch scanning	Grid based - Clicker	Category 4	Category 1	Category 1 Grid based - Clicker Category 2
Reason for use	All work Category 1 when tired	Framed questions To aid comprehension	Story and creative writing	Encourage wider vocabulary use	To support dyslexic type difficulties
Benefits:	Access Support -when other software has not been	Sense of achievement and success Task completion	Confidence Freedom Wrote more Spoken vocabulary	None but blamed this upon the way it had been introduced	Grid based – writing up topic based information Category 1 and 2– useful for pupils with good oral ideas but difficulty

	appropriate		Not inhibited by poor spelling		with putting this into written text
Modifications/ adaptations	Size of font (Wivik) Dictionary size (TextHelp)		No would have involved needing more IT skills		Category 2– make use of different vocabulary settings
Difficulties	Errors being saved	Some found it difficult to use – lack of ICT skills	Lack of speech support made difficulties with reading similar looking word Word choice –too large Inappropriate words sometimes use	Vocabulary too extensive for level of student Need to find and adjust level of software for appropriate needs of student	Requires initial input from teacher. Students need much encouragement to use
Thoughts on using this with younger children	A crutch May encourage wider use of vocabulary if dictionaries widened to suit	If used with skilled and sensitive practitioner – may benefit learning	Efficiency dependent upon reading skills of user	"should be super if the correct level is found and used"	Rewarding as younger dyslexic students often have good vocabulary but are unable to write longer words. Good word prediction software must have speech feedback.

Considerations of Text Prediction Use: Pilot Study A:

The questionnaire was primarily designed to be purposive but the data contained within responses provided useful background information. Younger students (aged five onwards) all used word banks displayed in a grid (Clicker) and although this was not unexpected (because Clicker was also marketed towards the younger age spectrum) there was no indication that any other type of text prediction was used with a younger age range. Other categories of text prediction were used with students aged between 9 to 23 years. However, as the type of software varied significantly, there was little to correlate between age and type from only five responses.

However, the reasons cited for use were far more illuminating and gave insight and indication of contextual use. These included fatigue issues, comprehension, framing writing activities and vocabulary use. Respondents also cited perceived benefits from use and included reference to access and support, confidence building, increased writing quantity, extension of vocabulary use and spelling support; reflecting similar benefits to those suggested by MacArthur (2009). One respondent referred to successful use specifically with a student with dyslexic issues who had difficulty with written expression but able to verbally express meaning adequately. Others also suggested text prediction used as a support mechanism for those who had good ideas and vocabulary, but were unable to convert this into written text.

All respondents referred to some difficulty with software administration and use which, regardless of the type or age of the software used, generally centred on administrative controls. In some products, mention was made of errors being saved and reappearing as suggested text. This suggested that if the software offered flexibility or different settings, it was essential that those who administered or supported its use should be aware of these from the outset.

The length of time that text prediction was used, either by students themselves, or encouraged to do so by their facilitators, was of particular interest. One respondent recalled some using it for periods of up to two or three years whilst another who (albeit a few years previously) had trialled the software with about fifty students over time. There was no mention of any out of school contexts of use. Any utilisation was also entirely dependent upon individual requirement and perception of efficacy as this respondent outlined:

> *"I have not found many students who use this software over a prolonged period of time and continue to find it useful".*
> *"Some found it useful, others less so."*
> (Rita, Questionnaire, 2009)

However there were many variables that impacted upon use, let alone any perceived efficacy, as the same respondent indicated a number of potential themes for further exploration, of which utilisation of software was but one:

> *"The students who are introduced to it are most often disaffected students who have already experienced failure in written language terms over a long period of time. They are only identified as needing help after some time and many have the resultant poor self-esteem. Introducing yet another strategy and one which requires quite significant perseverance and application skills, in many cases in a situation where there is not enough one-to-one support, can be counterproductive. One must not assume that the use of a computer will necessarily motivate a student and motivation is certainly something which predictive typing requires!" (ibid)*

Specific need, failure over a period of time, self esteem, support and perseverance were all reported as contributing factors to be considered and, as the respondent stated, using software or the computer did not resolve writing issues. Its use also introduced other requirements that compounded any issue of consideration. Comments indicated that text prediction was perceived as a compensatory resource for writing failure rather than as one to encourage emergent writing development from the outset. It reflected Edyburn's view that educators historically search for methods to do the same task and seldom look to see if there are different or *"compensatory strategies that use technology to enhance performance"* (2006 :49). Yet, when the utility was introduced later, as a compensatory resource, more complicating issues of lack of confidence and writing failure existed and had become inextricably linked into the cyclical issue of writing difficulty and negativity. The mere adoption of a technology was not sufficient to compensate for this. From a research perspective, it appeared, therefore, that any focus upon the use of text prediction would be difficult to extract from the practical issues of wider digital technology use and the complexity of writing issues.

Responses also indicated a wide time span in the age of software and it was essential that subsequent analysis within the main study would be able to cope with this. Yet it also drew attention to aspects beyond mere software utilisation and touched upon areas that were to become a major focus in this study in the context of individual learning needs and the expectation on teaching staff to be aware of rapidly changing technological resources. It highlighted topics that could only be explored in far greater depth through any subsequent interviews in Phase Two.

Appendix P

Table 13: Consideration of Questionnaires Phase One (Main Study and Pilot Study)

Question	Response	Consideration
Age range of user (years)	9-16 5-11 (literacy) 21–23 8-18 (mainly dyslexia) 6 -18 (dyslexia and physical impairment) 6-16 (physical impairment) 10 (literacy) 6 -18 (physical impairment and literacy) 6 -16 (literacy)	Difficult to differentiate specifically between uses for physical impairment, literacy development and dyslexia specifically. Mixed use of all types of prediction from grids to words. Different time periods of software use – older and present.
How long did students use it?	• For life • Short period • 3 months • 2-3 years • 6 months • 1 year	Variable No differentiation between purpose/user/type
Why was software used?	• Story writing • Creative writing • Improve vocabulary • Dyslexia issues • Reduce keystrokes • (Impairment) • Slow writing speeds • Spelling difficulties • Develop sentence structure (grids) • Handwriting • Reduce fatigue (not just those with	

	physical disability)	
What benefits were seen?	• Reduced number of keystrokes • Assisted motivation • Increased written output • Increased confidence/sense of achievement/self esteem • Confidence to put ideas into print • Not inhibited by poor spelling • A "crutch" • Encourage new vocabulary • Helped those with good verbal ability but not written skill • Independent activity • Quality of output not just what could be spelt • Improvement in reading ability • 50% increase in writing speed for switch users • Reinforced spelling • Teacher awareness/recognition of difference in productivity/ability • Reinforcement of phonic work	
What difficulties were encountered?	• Reading ability restricted use • Text to speech feedback essential • Lack of support from teachers and support staff • Too many words predicted • Using predicted words in wrong context • Poor ICT skills to cope • Needs keyboard awareness • Software "remembering error" • Required "lots of teacher	

	encouragement" • Training • Requires effort from both staff and student • Requires "good literacy skills" • Not useful for fast typists/keyboard users (better with word processing and spellchecker) • Requires perseverance • Predict ahead (by context tool) can become "a sentence completion tool" – not necessary for all users	